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REVIEWS

CABINET CYCLOPÆDIA.—*History of Russia.* Vol. I. Longman & Co.

IN the present state of Continental Europe, when the attention of the public is every day more and more attracted towards Russia, a history of that country is undoubtedly a desideratum in our literature, and it was with great satisfaction that we read the announcement of such a work. It was, too, fairly to be inferred that one writing for the Cabinet Cyclopædia—one whose work was to form part of a series which has been illustrated by Mackintosh, Sismondi, Dunham, and other distinguished historians, would be well acquainted with the subject. This was but a reasonable expectation, yet we regret to add that it has been disappointed. The writer of this History of Russia is ignorant of the very elements of the subject of which he here professes to treat, and unable, we suspect, even to read the language of the earlier records in which that history is written. We shall not weary the reader with an enumeration of the numberless minute errors into which he has fallen, but come at once to such general observations, as tend to prove that he was wholly unqualified for the duty which he has undertaken to perform.

To begin with the beginning, the writer thus speaks of difficulties which attend researches into the ancient history of Russia:—

"One or two modern historians attempted to penetrate the labyrinth; but they were baffled in its windings, and came out bewildered. The works which they have given to the world as the produce of its research, are no better than ponderous monuments of inextricable confusion."

Now, had the writer known that nearly all the early history of Russia is comprehended in the Chronicle of Nestor, he would hardly have talked about the *windings of a labyrinth:* and as to his sweeping censure of the modern authors, and their "ponderous monuments of inextricable confusion," we should really like to know somewhat more specifically what he objects against Schlötzer, Müller, Schmidt-Phiseldeck, Karamsin, &c., men to whose profound erudition and sagacity the learned of all Europe have paid a due tribute of approbation, and whose labours are generally admitted to have thrown great light on the obscure points of Russian history. If the present writer be, as we suspect, wholly unacquainted with their works, it is certainly his fault, and not theirs.

The account of the Slavi, in the first chapter of the work before us, is sufficiently well written, and rests on the best authorities; but as we proceed we have less reason to be satisfied; and assuredly we are not required by courtesy to spare a writer who is so little inclined to be courteous to others. Thus, after a little cackling over a conjecture of his own, that the name of the people, Russians, is derived from Russalki, the goddesses of waters and forests, he thus speaks of Segur:—

"Count Segur, whose 'History of Russia and of Peter the Great' was no doubt intended to contain the essence of all that was worth preserving in the annals of the country, while it is, in reality, no better than a bad chronology of the leading events, makes some very foolish blunders in his own dogmatical way. For instance, he asks, 'How do we know that the appellation of Russian, generally adopted since the time of Rurik, was not derived from him?' The answer is simply, because we know that it existed in Russia previously to the time of Rurik, and, therefore, could not have been derived from him. Again, he inquires, 'May not the Slavonians, whose demi-gods of the waters were called Russalks, have given that name to the Scandinavian Varangian pirates, who were more truly the demi-gods of the billows that foamed under their keels?' The answer is, that the Russalks, or Russalki, were not demi-gods of the waters, but nymphs of the woods and rivers: and that, therefore, it is not at all likely the Slavi could have chosen their name as a designation for the ferocious Varangians, who were not only their insidious enemies, but who became their sovereigns by usurpation."

Now, we have little patience with our author's dogmatical condemnation of another writer, and the less so, when, having had occasion to compare Segur's work with his own, we found that he was repeatedly indebted to the Count, although he had forgotten to acknowledge it. After all, what Segur says respecting the origin of the name of Russia, is collected from the best authorities on this subject. But suppose he had fallen into error by an overstrained conjecture, it was not for one who speaks (p. 80) *of the fire of the Russian soldiers* in a battle fought at the beginning of the eleventh century, and gravely tells us (p. 137) that the Tartars who invaded Russia in 1237, *did not put themselves to the trouble of a formal bombardment* in attacking Vladimir,—it was not for such a man to be very severe upon chance errors.

If, indeed, we were inclined to look with equally critical eyes into the work before us, we might ask the writer, on what authority he makes Oskold *the step-son* of Rurik? (p. 24), a relationship of which the earlier annalists were quite ignorant; and we ought, perhaps, to acknowledge our obligations to him for the information (p. 24) that Oskold's expedition to Constantinople, who went thither destroying and ravaging all within his reach, "*was manifestly of a mercantile nature.*" Enlightened by this discovery, we may now reasonably infer that the Norman sea kings, who desolated the coasts of England and France in the eighth and ninth centuries, came thither on commercial business, and no doubt laid waste with fire and sword merely to create new wants in the country they came to trade with.

The story (p. 43) about Sviatozlaf's adopting the manners of the Kalmuks, although that nation first became known to the Russians many centuries after Sviatozlaf's death, strongly savours of the *firing* in the eleventh century; the account of Vladimir's playing the schoolmaster, "establishing seminaries for the education of the different classes of the community," and taking "the children of the nobility and others by force from their parents, and placing them in these establishments," (p. 75), is also well told, but unfortunately has no foundation in history: and the particulars of the manner in which he divided the country amongst his children are equally incorrect; for Vladimir established his sons as governors of the provinces intrusted to their care, and not as tributary princes, as asserted by our author.

We shall pass over many similar errors; but we must notice some blunders, which positively change the very character of events, and lead to false conclusions; and these blunders unfortunately increase in number and importance as the author advances in his narrative. Thus, speaking of Yaroslaf, he tells us that this prince was greatly endeared to the people of Novgorod "by the wisdom and mildness of his sway" (p. 80): whereas Yaroslaf was notorious for his cruelty and injustice towards his subjects, when he was prince of Novgorod; and it is one of the noblest traits in the history of that republican city, that when he appealed to the generosity of the people, asking pardon for his cruelties, and imploring their aid against his brother, they forgot their injuries, and granted the required assistance. Other historians have been somewhat perplexed how to account for such extraordinary generosity to that tyrant prince, to whom the present historian, undoubtedly prompted by the inspirations of his own benevolent disposition, gives such an amiable character.

The most interesting event in the early history of Russia, is the promulgation of the code of laws by Yaroslaf, in the early part of the eleventh century. In reference to this important subject, the writer begins by a conjecture, that as there were commercial cities in Russia at the time of what he calls the invasion of Rurik, there must have been some regulations to render individuals amenable to the common good. Now, he would have been saved from the necessity of speculating on the probabilities of the question had he read in Nestor, that the Novgorodians and their allies, in calling Rurik and his brothers to the sovereignty, declared *that they wished for a prince who should govern them according to the laws;* and he ought to have known, that, in the treaty of Oleg with the Emperor of Constantinople, express mention is made of the *Russian laws.*

After this needless conjecture, the author positively informs us (p. 86), that before Yaroslaf, none of the nations who together comprised his empire, had any written laws, but that the country was governed by some "*unsystematic and rude usages,* and that Yaroslaf *cast out* "*this monster of incongruities,*" *and supplied its place with* "*a series of written laws, in which some sacrifices were made to popular customs,*" *&c.* (p. 87.)

We have already shown that there were laws in Russia before Yaroslaf. It may be, indeed, that they were only customs preserved by tradition, but it is likewise possible that they had been committed to writing; at least, we have no historical evidence to justify an assertion to the contrary, which must be received just for what it is worth, as resting wholly on the authority of the present writer. Further, as the code of Yaroslaf contains many regulations, borrowed from the laws which had already been established in Germany and Scandinavia, and were evidently imported from those countries by the Varangians, who at that time constituted the most influential part of Yaroslaf's subjects, the author's statement, that they had never been written before that time, becomes doubly problematical. Again, we must observe, that wherever a code of laws was promulgated for the first time, it was invariably a collection of ancient customs which had already governed the country, with such changes as experience proved to be necessary, and with the addition of some new regulations, required by the exigencies of an advanced state of civilization; unless some revolution, as, for instance, a conquest effected

by a foreign power, introduced a complete change in the form of government. We ought, perhaps, to except from this general rule, the legislators of the ancient world, who, like Solon and Lycurgus, are believed to have promulgated a code of laws founded on principles deduced from a profound reasoning on human nature. However this may be, we have no reason to suppose that Yaroslaf had anything in common with the philosophic legislators of ancient Greece, or that the formation of his code should be considered an exception to the general rule followed by all other nations. It is, moreover, the opinion of the best writers on this subject, that Yaroslaf collected the ancient Sclavonian and Varangian customs, and promulgated them, probably with some changes and additions.

The extract which the author has given from the above-mentioned code is not free from error; but the following illustrative note is surely unrivalled in historical literature. Speaking of the fines by which various crimes and offences were punished, and of which the highest, for the murder of a boyard or nobleman, was eighty *grivnas*, the writer informs the reader that the grivna is "a copper coin, of the value (as near as we can ascertain) of about 4½*d.* of our money," by which he reduces the highest penalty, enacted by the above-mentioned laws, to a fine of thirty shillings English money. Now a learned historian should have known, 1st, that there were gold and silver grivnas; 2nd, that the *grivna*, to which the code of Yaroslaf refers, was *half a pound weight of silver;* and there is some difference, it must be admitted, between a penalty of thirty shillings and that of forty pounds weight of silver; 3rd, that the Russian grivna of our days, the value of which is about 4½*d.* English, is not a copper, but a silver coin; and that there is no copper coin of that denomination, except a fictitious one of the value of about an English penny.

This subject (the value of the ancient grivna) has been thoroughly investigated by others, who have heretofore written on the history of Russia; and we cannot but believe that this *one* is quite as important as *all* the *foolish blunders* together which the writer is pleased to ascribe to Count Segur. If, indeed, instead of abusing the Frenchman, he had followed him more scrupulously, he would not have omitted to notice one of the most important provisions of Yaroslaf's code, which Segur mentions, on the authority of Karamsin, —a writer whom our present historian quotes, although it is pretty evident that he has never read him—we mean, *the trial by jury;* expressly enacted by those laws, and borrowed, like many other regulations of the same code, from Scandinavia, where it was already established in the eighth century.

We cannot omit mentioning another strange blunder of our historian, who gravely tells us, that one of "the earliest errors" of Yaroslaf, was the resignation of Novgorod to his son Vladimir, who had no sooner ascended the throne of the republican city, than, under the pretext of seeking satisfaction for the death of a Russian, who had been killed in Greece, he carried arms into the Byzantine empire. We are at a loss to comprehend how a prince, reigning in a city situated near the shores of the Baltic, and separated from those of the Black Sea by the dominions of his father, could undertake, without the consent of the latter, an expedition against Constantinople, unless, indeed, the historian, who has already established the use of fire-arms in the eleventh century, can add to his discoveries proof of the knowledge of balloons on a more improved system than those of our own time. Till then, we must admit the evidence of other historians, who unanimously relate that the expedition against Constantinople was undertaken by the express direction of Yaroslaf himself, who intrusted the command of it to one of his most experienced leaders, and to his son Vladimir; and that the expedition was undertaken from Kief, which is situated in the south, and not from Novgorod, which lies in the north of Russia.

To us, the most interesting part of the history of a foreign nation is undoubtedly that which refers to its relations with our own country. We therefore expected that the present writer, who has entered into many vague dissertations upon less interesting subjects, would give us some information relating to the early intercourse between England and Russia. This important event, however, is noticed incidentally, and dismissed in the following note:—

"A letter from Ivan to Elizabeth, in which he solicits a promise that she will grant him an asylum, should his ungrateful subjects render it necessary for him to retire from Russia, is still extant. Ivan was interested in the character of the English people, by an accidental acquaintance he formed with some English gentlemen, who were travelling through Russia for their amusement. He received them with kindness and hospitality, and expressed himself much pleased with the account they gave him of their native country. Lieutenant Holman, the blind traveller, whose extraordinary vigour of mind and indomitable perseverance appear to have compensated him for the loss of his sight, informs us, in his Travels in Russia, that there are preserved, in the College of Foreign Affairs, 'a variety of letters and treaties between Elizabeth of England and the Czar Ivan Vasilovitch, relative to the commercial relations of the two countries, as well as on other subjects; and amongst the more interesting, was one in which Elizabeth, in reply to a request to that effect, promises the Russian monarch an asylum in her kingdom, with every due honour, in the event of a revolution in his empire; and another, in which he begs of her to send him a doctor; the result of which was, that Doctor Robert Jacobs was appointed to that office.'"

Now, had the author read Karamsin, whom, as we before observed, he quotes more than once, he must have there found a copy of the identical letter of Elizabeth promising an asylum to Ivan Vasilovitch, as well as much general information respecting the commercial and diplomatic relations between England and Russia; and we might have been spared the "prittle prattle" about the *English gentlemen travelling in Russia for their pleasure!*

Before we dismiss altogether this rather wearisome subject, we must quote one further proof of the carelessness with which this work has been compiled. After having described the state of Russia at the extinction of the dynasty of Rurik, the author enters into a political dissertation on Poland and Russia (page 288), and deduces large inferences from the fact, that "a comparison of the contemporary histories would show that Poland retained her original dynasty longer than Russia," &c. Now, such a comparison would show anything rather than what the author asserts; for the original dynasty of Poland, that of Piast, was extinct in the fourteenth century; consequently more than two hundred years before the extinction of the Russian original dynasty of Rurik, as the writer might have seen by reference to any history of Poland,—even the compilation which appeared under that name in the Cabinet Cyclopædia itself. So much for the fact—what, then, becomes of the inferences?

Memorials of Mrs. Hemans, with Illustrations of her Literary Character, from her Private Correspondence. By H. F. Chorley. 2 vols. Saunders & Otley.

This publication originated, it appears, in the general approbation with which the 'Personal Recollections of Mrs. Hemans,' which appeared last year in this paper, were received. As it might therefore be presumed, that we were prejudiced in favour of the work, we shall leave it to speak for itself without further comment.

We shall introduce our extracts from the letters, which form the staple of the volumes, by some account of Mrs. Hemans's early life:—

"As a child Mrs. Hemans was an object almost of devotion, for her extreme beauty; her complexion was remarkably brilliant—her hair long, curling, and golden;—in the latter years of her life its hue deepened into brown, but it remained silken, and profuse, and wavy, to the last. She was one of those, too, who may be said to be born and nurtured in the midst of prophecies. Who can tell how little or how much impression passing words carelessly spoken may make upon one so sensitive?—One lady incautiously observed, in her hearing, 'That child is not made for happiness, I know; her colour comes and goes too fast.' She never forgot this remark, and would mention it as having caused her much pain at the time when it was spoken. * *

"The plan of these memorials has precluded the possibility of a close inquiry into the domestic history of these years—and I regret that I cannot enrich my pages with a few anecdotes of her youth, such as I well remember Mrs. Hemans telling, which have now vexatiously escaped from memory. One or two characteristic notices, however, in addition to the above, have collected themselves. From one lady—who was surprised into tears upon meeting her unexpectedly in society, and contrasting her somewhat faded but expressive features with the girlish beauty she had admired many years before—I have learned that the interest excited by her talents and attractions, when quite a child, was remarkable; not merely in her own family, but likewise among those who, from their sober years and habits, might hardly be expected to sympathize much with the flights and fancies of a young genius, however beautiful. * * And a sprightly passage will be found in a subsequent letter, by which it appears that her fascinations included simple as well as gentle—I mean her reference to the old gardener, who used to say that 'Miss Felicia could 'tice him to do whatever she pleased.'

"When Miss Browne was little more than five years of age, domestic embarrassments, arising from the failure of the mercantile concern in which her father was engaged, led him to remove his family from Liverpool to North Wales. The house in which she passed the greatest part of her childhood, was precisely such an one as from its situation and character would encourage the developement of her poetic fancies. Grwych (now partially ruined) is not far from Abergele in Denbighshire; a solitary, old, and spacious mansion—lying close to the sea shore, and in front shut in by a chain of rocky hills. * * She loved to contrast the fancies born within and around its precincts, with the realities of her after lot; she would say that, though she was never ambitious, could she then have foreseen the fame to which she was destined to rise, the anticipation would have excited a thrill of pleasure, such as the possession had never awakened. She was early a reader of Shakespeare; and, by way of securing shade and freedom from interruption, used to climb an apple tree, and there study his plays; nor had she long made familiar friendship with his 'beings of the mind,' before she was possessed with the temporary desire—so often born of an intense delight and appreciation—of personifying them. It is remarkable that her fancy led her to prefer the characters of Imogen and Beatrice; nor were her favourites without strong points of resemblance to herself—the one in its airy sentiment tempered with sweet and faithful affection—the other in its brilliant wit redeemed by high-mindedness, from sarcasm or vulgarity—so early were her tastes and personal feelings and mental gifts identified! The sea-shore was her forest of Ardennes: and she loved its loneliness and freedom well: it was a favourite freak of hers, when quite a child, to get up privately, after careful attendants had fancied her safe in bed, and, making her way down to the water-side, to indulge herself with a stolen bath. The sound of the ocean, and the melancholy sights of wreck and ruin, which follow a storm, made an indelible impression upon her mind, and gave their colouring and imagery—

A sound and a gleam of the moaning sea—

to many of the lyrics, which were written when she began to trust to her own impulses, and to draw upon her own stores, instead of more timidly resting under the shadow of mighty names.

"Those who are born poets, will find food for the desire within them, under the most ungenial circumstances, and in the midst of the harshest trials—just as the real lover of flowers will contrive not to be without a leaf or a bud, wherewith to cheer his eye, though his home be the most airless court in the heart of a vast city. To some, persecution and difficulty are salutary, and their energy must be aroused by resistance. Mrs. Hemans was not one of these. I have often thought that there could be few lots more favourable to the developement of imagination and sentiment, more calculated to excite a thirst for knowledge, than hers,—her own peculiar disposition being taken into the account. Enough was granted to encourage,—enough withheld to quicken aspiration."

In pursuing this subject further, Mr. Chorley observes—

"While such are the peculiar advantages and pleasures which attend the youth of genius developing itself in seclusion, that condition is subject to other influences to which it may be well,—nay, it is a duty for one to advert, who would trace out the poetic character with reference to the high destinies of the art. The same position which is most favourable to the imagination may be unfriendly to the general sympathies. The young recluse, feeling himself apart and alone in the right of his mind—the idol of a small and devoted circle,—is too apt to throw himself exclusively upon peculiar veins of thought; too fastidiously to adhere to such objects alone as are dearest to himself, and thus feebly to prize, if not utterly to fail in gaining, the poet's highest attribute.

* * *

"It would be difficult, were the whole range of our imaginative literature searched through, to discover a more perfect illustration of the above remarks than is to be found in the works of Mrs. Hemans, and in the progress of mind they register. That she did only a partial justice to her powers, must be admitted by all who ever held friendly intercourse with her: they will feel, too, that she was summoned away at the moment when she might, and must, have risen higher than she had ever done before. Her first works are purely classical or purely romantic; their poems may be compared to antique groups of sculpture, or the mailed monumental figures of the middle ages set in motion. As she advanced on her way, sadly learning the while the grave lessons which time and trial teach, her songs breathed more reality and less of romance; the too exclusive and feverish reverence for high intellectual or imaginative endowment, yielded to a calmness, and a cheerfulness, and a willingness more and more, not merely to speculate upon, but to partake of the 'beauty in our daily paths.' Had she lived to bring these yet more fully to bear upon the stores of knowledge she had heaped up, she would have produced a work as far superior to any she has left us, as her own latest lyrics and scenes exceed the prize poems of her girlhood:—the first frigid exercises of a timid and trammelled writer."

We shall now pass at once to that period of life, when her powers were fully developed, and select here and there such passages from the letters, as seem either most characteristic or most likely to interest the reader. It is not always possible to give a satisfactory reason for the preference—something perhaps must be allowed for our own taste, temper, or mood of the moment. We say thus much, because we suspect, that many persons would prefer the correspondence with Mr. Milman, respecting 'The Vespers of Palermo,' or the letters to Joanna Baillie, Mary Howitt, Miss Jewsbury, and Miss Mitford:—all illustrative of a womanly sympathy with writers of her own sex. But we shall add a pleasant letter from Scotland to those, with like date, which appeared heretofore in the *Athenæum*.

"Chiefswood, July 13th.

"Will you not be alarmed at the sight of another portentous-looking letter, and that so soon again? But I have passed so happy a morning in exploring the 'Rhymour's Glen' with Sir Walter Scott, that, following my first impulse on returning, I must communicate to you the impression of its pleasant hours, in full confidence that while they are yet fresh upon my mind, I shall thus impart to you something of my own enjoyment. Was it not delightful to ramble through the fairy ground of the hills, with the 'mighty master' himself for a guide, up wild and rocky paths, over rude bridges, and along bright windings of the little haunted stream, which fills the whole ravine with its voice? I wished for you so often! There was only an old countryman with us, upon whom Sir Walter is obliged to lean for support in such wild walks, so I had his conversation for several hours quite to myself, and it was in perfect harmony with the spirit of the deep and lonely scene; for he told me old legends, and repeated snatches of mountain ballads, and showed me the spot where Thomas of Ercildoune

> Was aware of a lady fair,
> Came riding down the glen,

which lady was no other than the fairy queen, who bore him away to her own mysterious land. We talked too of signs and omens, and strange sounds in the wind, and 'all things wonderful and wild;' and he described to me some gloomy cavern scenes which he had explored on the northern coast of Scotland, and mentioned his having heard the deep foreboding murmur of storms in the air, on these lonely shores, for hours and hours before the actual bursting of the tempest. We stopped in one spot which I particularly admired; the stream fell there down a steep bank into a little rocky basin overhung with mountain ash, and Sir Walter Scott desired the old peasant to make a seat there, kindly saying to me, 'I like to associate the names of my friends and those who interest me, with natural objects and favourite scenes, and this shall be called Mrs. Hemans' seat.' But how I wished you could have heard him describe a glorious sight which had been witnessed by a friend of his, the crossing the Rhine at Ehrenbreitstein, by the German army of Liberators on their return from victory. 'At the first gleam of the river,' he said, 'they all burst forth into the national chaunt, *Am Rhein, Am Rhein!* They were two days passing over, and the rocks and the castle were ringing to the song the whole time, for each band renewed it while crossing, and the Cossacks with the clash and the clang, and the roll of their stormy war-music, catching the enthusiasm of the scene, swelled forth the chorus *Am Rhein, Am Rhein!* I shall never forget the words, nor the look, nor the tone, with which he related this; it came upon me suddenly, too, like that noble burst of warlike melody from the Edinburgh Castle rock, and I could not help answering it in his own words,

> 'Twere worth ten years of peaceful life,
> One glance at their array.

"I was surprised when I returned to Chiefswood to think that I had been conversing so freely and fearlessly with Sir Walter Scott, as with a friend of many days, and this at our first interview too! for he is only just returned to Abbotsford, and came to call upon me this morning, when the cordial greeting he gave me to Scotland, made me at once feel a sunny influence in his society. ..... I am going to dine at Abbotsford to-morrow—how you would delight in the rich baronial-looking hall there, with the deep-toned coloured light, *brooding* upon arms and armorial bearings, and the fretted roof imitating the faëry sculpture of Melrose in its flower-like carvings! Rizzio's beautiful countenance has not yet taken its calm clear eyes from my imagination; the remembrance has given rise to some lines, which I will send you when I write next. There is a sad *fearful* picture of Queen Mary in the Abbotsford dining-room. But I will release you from further description for *this* time, and say farewell.

"Ever faithfully yours,
"F. H."

Here are a few sketches of Edinburgh:—

"Albyn Place, Edinburgh, August 21.

"I hope you have not felt anxious on account of my silence, which, indeed, has been unusually long; but for several days after I last wrote, I was so languid, from over-fatigue, that I could only '*think to you*' as I always do when anything interests me. I am now better again, having been allowed a little more repose, and finding myself much protected in Lady ——'s house (where I have passed the last fortnight) from the *inconveniences of celebrity*, which, to me, are often painfully oppressive. I cannot tell you how very welcome your letters are to me; how much they always seem to bring me back of pure and home-feeling—'the cup of water,' for which my spirit pines in the midst of excitement and adulation, and to which I turn from all else that is offered me, as I would to a place of shelter from the noon-day. .....I have lost the Castle now, and its martial music, being removed to a much less inspiring part of the town; but a few nights ago, I made a party to walk through some of the most beautiful streets by moonlight. We went along Prince's-street to the foot of the Calton Hill, and gazed down upon Holyrood, lying so dark and still in its desolateness, and forming so strong a contrast to the fair pillars of the Hill, which looked more pure and aërial than ever as they rose against the moonlight sky. '*Mais qu'ils se passent des orages du fond du cœur!*' and how little can those around one form an idea from outward signs of what may be overshadowing the inner world of the heart! Such a sense of strangeness and loneliness came suddenly over me, surrounded as I was, amidst all this dusky magnificence, by acquaintance of yesterday. I felt as if all I loved were so far, far removed from me, that I could have burst into tears from the rush of this unaccountable emotion. Had I possessed any power of '*gramarye*,' you would certainly have found yourself all of a sudden transported through the air. I am sure you would have enjoyed the scene, with all its bold outlines, gleaming lights, and massy shadows. * *

"I have just returned from paying the visit I mentioned, to old Mr. Mackenzie, and have been exceedingly interested. He is now very infirm, and his powers of mind are often much affected by the fitfulness of nervous indisposition; so that his daughter, who introduced me to his sitting-room, said very mournfully as we entered, 'You will see but the wreck of my father.' However, on my making some allusion, after his first kind and gentle reception of me, to the 'men of other times' with whom he had lived in such brilliant association, it was really like the effect produced on the Last Minstrel,—

> — when he caught the measure wild,
> The old man raised his face, and smiled,
> And lighted up his faded eye;

for he became immediately excited, and all his furrowed countenance seemed kindling with recollections of a race gone by. It was singular to hear anecdotes of Hume, and Robertson, and Gibbon, and the other intellectual 'giants of old,' from one who had mingled with their minds in familiar converse. I felt as if carried back at least a century.

"'Ah!' said he, half playfully, half sadly, 'there were *men* in Scotland then!' I could not help thinking of the story of 'Ogier the Dane,'—do you recollect his grasping the iron crow of the peasant who broke into his sepulchre, and exclaiming, 'It is well! there are men in Denmark still.' Poor Miss Mackenzie was so much affected by the sudden and almost unexpected awakening of her father's mind, that on leaving the room with me, she burst into tears, and was some time before she could conquer her strong emotion. I hope to have another interview with this delightful old man before I leave Edinburgh."

With an old familiar subject, "a happy New Year," treated very beautifully, we must conclude for the present:—

"I think I must have seemed very ungrateful, in not having more warmly thanked you for all your good wishes on the approach of another year, which have been so kindly expressed. But there is something in the expression of such wishes, when I know them, as I *do* know them, from you to be cordial and sincere, which awakens within me a feeling at once too grateful and too sorrowful to find utterance in language. They come to me almost as joyful music from shore might come to one far on the waters, speaking of things in which he has 'neither part nor share,' and yet the sound is welcome. Will you believe how unfeignedly I would return such wishes to you, whose path yet lies before you, and yet I fain hope would lead to happiness? And wherever that

path may take you, or whatever *my* fate may be, when you would seek pleasure or comfort from the idea that you are followed by many and earnest thoughts of kindness, will you then think of me, as one who will ever feel in your welfare the faithful interest of a sisterly friend?"

The Diary of Sir Henry Slingsby, of Scriven, Bart.: now first published entire from the MSS. &c.; and extracts from Family Correspondence and Papers, with Notices, and a Genealogical Memoir. By the Rev. Daniel Parsons. Longman & Co.

THERE is no pleasanter way of becoming acquainted with the manners of our great-grandfathers, than by breaking the envelope of some worm-eaten bundle of letters, and burying ourselves deep in the unexaggerated details of a private correspondence. It is almost needless for us to recall the delight we took in the noble picture thus furnished us by Evelyn, of the studious meditations and desires of an old English gentleman: or to revert to the amusement for which we are indebted to Pepys, whether his shrewd and vulgar prattle be of his perriwigs "mighty fine," or of his new gilt coach in which the Roxalanas and Statiras of the merry monarch's court whiled away a morning, eating bread and butter and drinking ale; or whether it concern the less holiday care of contriving how to find a husband for his sister "who grows old and ugly." All who share our tastes and remembrances will understand, without further preamble, why we looked eagerly for, and what we hoped to find in, the book before us. Our expectations have been disappointed: the Diary is of small extent, and reads more like a work of premeditation, than of momentary impulse: and sufficiently copious extracts from it have been already laid before the public.

A brief biographical preface opens the volume, in which the date of Sir Henry's birth, of his entering at Cambridge, of his marriage, and other less important matters, are properly recorded. Subsequently we find him leaving the quiet retirement of his family to aid the royal cause, representing Knaresborough in the parliaments of 1640, voting among the fifty-nine against the bill for Strafford's attainder, and ultimately paying the price for his loyalty, by giving up his life upon the scaffold. Less highly gifted than Evelyn, less sprightly and communicative than Pepys, Sir Henry's Diary has still an interest, as showing us a kind husband, a wise father, a busy landlord; a man in heart grave, retiring, and contemplative, yet willing to come forward when called upon, without hope of personal gain; partaking of the struggles of civil war, and steadfastly devoting himself to uphold the cause which he judged to be right. We will not say that such records are *exclusively* English: but we are proud to call them ours, and prouder to believe that their spirit still animates our national character, though the dispensations of the time we live in have greatly changed the form in which it must be put forth.

This volume, however, offers us little which is extractable. The Diary, before it is devoted to record the share taken by its writer in England's great civil troubles, is chiefly filled with household matters — notices of the changes and beautifications made in the family mansion, and passing glimpses of domestic scenes. We read in one page, of the Lady Slingsby's "timorous and compassionate nature;" in another, of the "Altar cloath of purple colour, wrought with stripes of worstett, which was her own handiwork;" and again, of the sedate and maternal manner in which she ordered her household;—such traits and anecdotes being interspersed with grave saws and dissertations upon life and futurity, which the writer fancies are after the manner of Montaigne, in imitation of whom his journal was begun and continued. A few passages are curious, as throwing light upon the manners of the time.

"I had lett y^e^ Mills of Knasborough, and St. Robert's at 25*l.* y^e^ Quarter to a Millner at York, but he hath enjoy'd it but half a year, & now is gone away in my debt. Y^e^ Mills were worth a great deal more if they had had y^e^ same soke, w^ch^, whiles Knasborough Mills were y^e^ Kings, they had, but now y^e^ soak is bought & sold, since carrying hath been in use: & especially at y^t^ Mill at Goldsborough, drawing away y^e^ custome from y^e^ Mills by lending poor men mony & other courteseis we housekeepers may do. My father in his time began a suit against those y^t^ did grind away from y^e^ Mills, w^ch^ whiles y^t^ they were y^e^ Kings, those y^t^ were y^e^ Kings Tenants were bound to bring their Corn unto y^e^ Kings Mills: & having bought y^m^ of y^e^ King those y^t^ were ty'd to this soke, ought to be so still, or else in equity to be releiv'd. But y^e^ suit was so follow'd by those who had relation unto Judge Hutton, & y^e^ Mill of Goldborough soe near a neighbour to y^e^ Mill of Knarsborough, as my father could have no remedy. Y^e^ Mill of Knasborough being so near y^e^ town, it were more convenient for y^e^ town to have their corn ground there y^n^ to have it fetch'd a mile or two; but such is their perverseness y^t^ they will not be brought to do it, w^n^ they have nothing to find fault w^th^ concerning y^e^ Miller, but y^t^ they have their Corn well ground, and their own again; yet they will refuse to send, out of a conceit y^t^ he cannot but steale if he pay his rent, having so great a rent to pay, as they imagine. * *

"The number we are at this time in household is 30 persons whereof 16 are men servants, and 8 women, besides ourselves. Our charge is much every year alone certainly, being well accommodated w^th^ good faithfull diligent servants, so y^t^ at least I spend every year in housekeeping £500, if y^e^ demeane grounds w^ch^ I keep in my own hands be reckon'd according to y^e^ Rent it would give, & y^e^ charge in getting it; w^ch^ yet serves not y^e^ house w^th^ corn, but [I] am fain to buy."

Sir Henry then describes the novel custom of "burning y^e^ swarth they mean to plough, y^e^ ashes whereof by experience they find to yield a greater increase of corn y^n^ any other manner of lime," concluding quaintly enough by styling it "a course of husbandry never herebefore us'd in this latter age, in y^e^ end whereof this world must be consumed w^th^ burning, but sure it may be y^e^ cause of so great winds as we have had this whole year y^t^ hath done so much harm, both by sea & land."

In 1638 he appears first to have taken up arms, and philosophically consoles himself for the inconveniences of his new profession by finding, that "being a soulgier is a commendable way of breeding for a young gentleman, if they consort y^m^selves w^th^ such as are civil, and y^e^ quarrel lawfull." To this follow further notices of his wife's sickness, and the remedies employed by her physicians; of a journey from Scriven (county of York) to London, which lasted twelve days; and a memorandum, that the rent "of Mrs. Sandwithy's house in Lincolnes in fieldes" was "22*l.* y^e^ quarter for y^e^ first quarter, and afterward 40*s.* y^e^ weeke for y^e^ rest of y^e^ time." A little further we light upon "excellent plowing land, lett dear about Knasborough," at 18*s.* an acre; and upon another entry, by which it would seem as if bribery and corruption at elections were, as yet, neither very common nor very expensive—these were days when, according to the household book, 11*l.* was "geven to Mr. Baron Snigges for his favore in y^e^ business in the Exchequere."

"There is an ill custome at these Elections to bestow wine in all y^e^ Town, w^ch^ cost me 16*l.* at y^e^ least & many a man a broken pate."

On the 31st of December 1641 Sir Henry records his wife's death, with a heartfelt and energetic panegyric upon her virtues and domestic qualities. We are now come to troubled times, and find little with which former journalists and historians had not already made us acquainted. The second part of the Diary, being written to beguile a period of confinement, wears more the air of a history, rather than a chronicle of passing events and feelings. Here is a testimony, contained in a few lines, to the character of King Charles, worth noting for its sincerity, and the characteristic trait which illustrates it.

"I never observ'd any great severity in y^e^ King, us'd either toward y^e^ enemy w^n^ he had him in his power, or to y^e^ Soulgier in his own army, except only at Wing, a house of my L^d^ Canarvan's where he command'd to be hang'd upon a sign post, a soulgier, for stealing a Chalice out of y^e^ church."

The Diary closes with the execution of King Charles; his faithful and respectable follower walked the same bloody path to the grave on the 8th of June 1658, having been (to quote his biographer) entrapped into joining the plots of Ormonde and Rochester with a view to his destruction. While in prison, he addressed himself to writing a legacy of rules for the good conduct and gentlemanly training of his sons—this tract, a very scarce one, is here reprinted. Sir Henry, indeed, seems to have had a due regard to the importance of education—speaks in his Diary with judgment concerning the way in which he would have his son instructed—and in proof that he did not undervalue its ornamental as well as its substantial part, we find him sending "violl stringes" to one of his sons, then at Queen's College, Cambridge, paying twenty-six shillings and eightpence to Mr. Hearne for "4^or^ mounthes teachinge of Mrs. Ellen Slingesbie to dance at Yorke;" and eighteen [pence?] "ffor a booke boughte fore M^r^ Will^m^. Slingesbie, called the 'Italian Scholmaister.'"

Flora Hibernica: comprising the Flowering Plants, Ferns, &c. of Ireland; arranged according to the Natural System. By J. T. Mackay, M.R.I.A. Dublin: Curry.

WE congratulate our Irish friends upon the publication of this work. It is most creditable to the naturalists of Ireland, that the first general account of the plants of that island should appear in a form corresponding to the actual state of science elsewhere. To Mr. Mackay in particular, the public is much indebted, that neither the example set him by some of our modern botanists, of pertinaciously adhering to the Linnean system of classification in their writings, although they never themselves employ it in practice, nor the fondness of the booksellers for what they, till very lately, found the selling side of the question, have induced him to bow before the Baal of Botany, or to join in the throng of worshippers of that brazen image which a powerful Swedish naturalist once set up as an object of adoration to his obedient disciples. Although the swelling ranks of the iconoclasts in natural history are no longer now in want of recruits, we nevertheless are glad, for his own and his country's sake, that the author of the first Flora Hibernica has not bound himself to a falling cause, but has joined the side on which victory must ultimately rest, as surely as truth is strong, and certain to prevail over error.

The characters of the classes and orders are taken chiefly from the writings of De Candolle and Lindley; and the arrangement employed by the last-mentioned botanist, in his 'Synopsis of the British Flora,' is followed, with few exceptions. The characters of the genera and species are chiefly from Hooker's 'British Flora;' for the matter relating to Mosses, Hepaticæ, and Lichens, the author is indebted to Dr. Taylor; and for the arrangement of the Algæ to Mr. W. H. Harvey, both of whom are naturalists well known for their acquaintance with those dif-

ficult groups. By these means the Flora of Ireland is completed, with the exception of Fungi. Considering how carefully the vegetation of these islands has been examined, it was not to be expected that much novelty should present itself among phenogamous plants. Lichens, however, make up for this; not fewer than thirty-five new species, and one new genus (Syncesia), being introduced. In his admission of reputed species, we think the author has generally shown a sound judgment; and we hope he will continue, in future editions, to evince a similar discretion, particularly as regards the genera Rubus and Salix, the overloading of which with false species has really been carried to a pitch of childishness that could hardly have been anticipated in the nineteenth century. He is, however, surely wrong in combining *Ulex strictus* with *U. Europæus*; and there can be but little doubt of the *Taxus fastigiata* being truly distinct from the *Taxus baccata*.

OUR LIBRARY TABLE.

'*Athens and Attica*, by the Rev. C. Wordsworth, M.A., &c.'—The topography of Athens is an instructive commentary on the works of her poets, her orators, and her philosophers. Enthusiastically attached to the beauties of nature, and especially the romantic scenery of his own Attica, the Athenian receives with rapturous delight appeals to those objects of his earliest love which were before and around him. The open theatre, under the Acropolis, gave the spectators a view of the national sanctuary, and justified the poet's expression, that "they were sitting under the wings of the Gods;" the clear blue sky of Greece, above the heads of the audience, naturally suggested to the poet those bold metaphorical allusions which constitute so great a portion of the sublimity of Æschylus. They are taken from objects almost before the eyes of those who listened to their recital, and hence much that appears to us forced, perhaps bombastic, was a natural element of the poetical atmosphere that surrounded the Athenian stage. Not less remarkable was the position of the orator on the Bema of the Pnyx. Let us also contemplate the philosophers lecturing in the porches, the groves of the Gymnasia, or on the bold head-land of Sunium. Can we wonder that they derived their imagery and illustration from the wonders of nature and art that surrounded them? We need not remind our classical readers of the many beautiful landscapes drawn in the dialogues of Plato, especially the one that introduces the conversation between Socrates and Phædrus, to whose accuracy, after so many vicissitudes of fortune, our author bears testimony. It is as a commentator on the dramatists, orators, and philosophers, rather than as a historian or antiquarian, that Mr. Wordsworth has examined the topography of Athens; his book, therefore, has little attraction for the general reader, but there are few from which the classical scholar will derive more instruction and pleasure.

'*Violet: or the Danseuse. A portrait of Human Passions and Character.*'—The grace and spirit with which certain scenes in this novel are written might have been expended more effectively upon a subject of higher order. Of all the fine arts, dancing surely stands the lowest on the scale: and to render a story characteristic, in which the Sylphs and Graces of the ballet are the chief female characters, would require a power far different from any here put forth. All the disenchantments of the *foyer* and the *coulisses*, their coarseness, their tawdry humour, their folly, their vice, are only touched upon as with the hand of "a waiting-gentlewoman"; in fact, we question whether an English public would endure a true and vigorous portrait of them. And here lies the inherent fault of the subject. The tale, then, not being characteristic, must take its place among the half fashionable, half sentimental novels of the day. Violet is a pretty, delicate, credulous heroine: D'Arcy, a *grave* deceiver (the *gay* ones "went out" when Byron's heroes came in). And the poetical justice of satiety, repentance and suicide, is properly administered at the close of the story, to crown the tale with a moral. The parents of Violet—he, a good-natured, extravagant, true-hearted musician; she, the remains of an actress, and a would-be fine lady, are pleasantly sketched: and old Dupas, the dancing-master, has a little part of his own in the story—which is not quite the old thing over again. *Au reste*, the story is readable, clearly told, but not very new.

'*A Practical Treatise on the Cultivation of the Vine on open Walls*, by Clement Hoare.'—We seriously recommend this little book to the attention of all horticulturists, as a sensible, well-written, very original explanation of many points of importance in the management of this valuable fruit tree. Books on Gardening are now become either such dreary and unprofitable repetitions of what has been said over and over again by previous writers, or such crude speculations, that it is quite consoling to find a hundred and fifty pages of good, useful, original matter upon so hackneyed a subject as the Vine. We would, in particular, call attention to the author's remarks upon the extent of the fruit-bearing powers of any given plant, and to his ingenious mode of arriving at a positive result upon this important subject. For example, he states, that from an extensive series of experiments he has been able to construct the following—

"*Scale of the greatest quantity of grapes which any vine can perfectly mature, in proportion to the circumference of its stem, measured just above the ground.*

Circumf.	lb.	Circumf.	lb.	Circumf.	lb.
3 in.	5	5½ in.	30	8 in.	55
3½	10	6	35	8½	60
4	15	6½	40	9	65
4½	20	7	45	9½	70
5	25	7½	50	10	75

"It will be seen that if two inches and a half be deducted from the circumference of the stem of any vine, the capability of it will be equal to the maturation of 10lb. of grapes for any remaining inch of growth. The proportionate quantity for fractional parts of an inch may be easily calculated." It is very true that, in general, vines are suffered to bear a much greater quantity of grapes than the above scale represents, but this the author considers, and with good reason, as one of the many errors attending the usual management of vines. This will serve to give an idea of the author's manner of dealing with his subject. The same good sense and original views are, with a few exceptions, conspicuous through his work, which we consider one of the best productions upon any horticultural subject which has been published for some years.

List of New Books.—Burgh on the Divinity of Christ, 16mo. 2*s.* 6*d.* bds.—Hall on Baptismal Regeneration, 12mo. 3*s.* 6*d.* bds.—Baxter's Call, 32mo. 1*s.* bds.—Mr. Midshipman Easy, by Captain Marryat, 3 vols. 31*s.* 6*d.* bds.—Sweet's Index to Bythewood and Jarman's Precedents in Conveyancing, royal 8vo. 22*s.* bds.—Fox's Protestant Reformation, fc. 3*s.* 6*d.* cl.—Edwards's Figures of Euclid, 3*s.* cl.—Hughes's Continuation of Hume and Smollett's England, Vol. IV. 8vo. 10*s.* 6*d.* bds.—Pearson's Overseers' Guide and Assistant, 12mo. 3*s.* swd.—Archbold's Practice of the Quarter Sessions, 12mo. 14*s.* bds.—Knox's Anatomist's Instructor, 12mo. 4*s.* 6*d.* bds.—Lardner's Cyclopædia, Vol. LXXXII. (James's Lives of Foreign Statesmen, Vol. III.) 6*s.* cl.—The Atonement, and other Sacred Poems, by W. S. Oke, post 8vo. 6*s.* bds.—Simeon's Works, Vol. IX. 8vo. 10*s.* cl.—Bilberry Thurland, with Illustrations, 3 vols. post 8vo. 31*s.* 6*d.* bds.—Violet: or the Danseuse, 2 vols. post 8vo. 21*s.* bds.—Simpson's Poetic Illustrations of Bible History, Part II. 12mo. 6*s.* cl.—Questions on the Church Catechism, 18mo. 1*s.* 6*d.* cl.—Truth without Novelty, Part I. fc. 2*s.* bds.—Hints for Reflection, 32mo. 2*s.* cl.—Best's Parochial Sermons, 12mo. 3*s.* 6*d.* bds.—Sacred Classics, Vol. XXX. (Horne on the Psalms, Vol. III.) 4*s.* 6*d.* cl.—Christian's Family Library, (Life of Rev. T. Scott,) 6*s.* cl.—Naturalist's Library, Vol. XIV. (British Moths, &c. Vol. II.) 6*s.* cloth.—French Letters from a Little Girl to her Mamma, square 16mo. 2*s.* 6*d.* cl.; 3*s.* 6*d.* silk.—The Science of Etiquette, 18mo. 1*s.* swd.—Songs and Lyrical Poems, by W. Story, royal 12mo. 5*s.* 6*d.* cl.—Jellicoe's Tithe Commutation Act, 12mo. 2*s.* 6*d.* swd.—Davis's Obstetric Medicine, 2 vols. 4to. 4*l.* 4*s.* cl.—History of Joseph, by the Author of 'Scripture Stories,' 4th edit. 18mo. 2*s.* 6*d.* bds.—Sinclair's (Miss) Modern Accomplishments, 2nd edit. cr. 8vo. 7*s.* cl.—The Faithful Friend, 3rd edit. 18mo. 2*s.* 6*d.* cl.—Posthumous Memoirs of Sir N. Wraxall, 2nd edit. 3 vols. 8vo. 42*s.* cl.—Winter Evening; or Tales of Travellers, by Maria Hack, 12mo. new edit. 7*s.* cl.—Evans's Sermons on the Spirit of Holiness, 3rd edit. 18mo. 2*s.* 6*d.*—The Language of Flowers, new edit. 18mo. 10*s.* 6*d.* silk.—Todd's Student's Guide, revised by Dale, 12mo. 6*s.* cl.—Head's Home Tour, 2nd edit. 12mo. 9*s.* 6*d.* bds.—Mrs. Child's Girl's own Book, with additions, by Miss Leslie, 12th edit. 12mo. 3*s.* bds.—Archbold's Poor Law Act, 4th edit. 12mo. 7*s.* 6*d.* bds.

SIXTH MEETING OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

[*From our own Correspondents.*]

WEDNESDAY, AUG. 24.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

THE first paper read was by Mr. W. Snow Harris, 'On some Phenomena of Electrical Repulsion.' The author observed, that almost all the physical evidence, in support of the particular theory of electrical action, insisted on by the French philosophers, and recognized by many eminent persons of this country, is almost entirely dependent on the experimental inquiries of Coulomb, communicated to the Royal Academy of Sciences at Paris in the year 1786, since which time very little has been effected in Statical Electricity. This is perhaps to be greatly regretted, because the principle employed by this distinguished philosopher in the course of his researches, viz. the divergence of similarly electrified bodies, is, in its application to the purposes of quantitative processes in electricity, liable to great uncertainty.

Mr. Harris showed that the repulsive force between two similar discs was not always in the ratio of the quantities of electricity, with which either one or both of them are charged; so that certain forces of repulsion might be, for example, in the ratio of 1 : 3, and yet the quantities of electricity be in the ratio of 1 : 2. The author traces this result to the disturbing influence of electrical induction, which was proved to operate not only between a charged and neutral substance, but also between two permanently electrified bodies, whether charged with similar or dissimilar electricities. This influence was such as to cause the law of the force between the repelling bodies apparently to change and become irregular, and was such as to become indefinitely modified by the various circumstances of distance, quantity, intensity, extension of the charged bodies, and the like, giving rise to very complicated results.

Mr. Harris considers the experiment, given in the Traité de Physique of Mons. Biot, viz. that of touching a hollow sphere charged with electricity, with a plate of equal area, to be involved in much uncertainty on this account, and endeavoured to show that no difference arose in the subsequent electrical state of the body touched, whether touched with a plate or a similar sphere; hence the traces of repulsion, indicated by the Torsion Electrometer, could not have indicated the true ratio of the quantities.

The author proceeded next to consider how far the indications of the Proof Plane were involved in similar irregularities; he presented to the Association the results of nearly 500 experiments on tangent discs of various degrees of thickness and extension; and endeavoured to show that its indications were materially influenced by the visible circumstances of position, intensity of charge, thickness, and the like, and did not necessarily show either the quantities or the ratio of the quantities existing in different points of a charged body. The author concluded by observing, that the admitted theories of electricity must, in the present state of this science, be viewed with great inquietude, since much of the physical evidence, on which they rest for support, may be shown to be imperfect.

Dr. Hare, of Philadelphia, inquired from Mr. Harris, how he would account for the attractions and repulsions of electrified bodies according to the known laws, if, as he understood Mr. Harris, the electric fluid had no hold upon, or was quite free from any relative action on, the material or non-electrical parts of the bodies.—Mr. Harris replied that he had not given the explanation as his own, but as a necessary result of certain theories of electricity which he had been combating; he therefore knew not how to reconcile the two views contrasted by Dr. Hare; and should be surprised if any person could reconcile them with each other, or the hypothesis with many phenomena.—Dr. Ritchie said, it appeared to him that it was utterly impossible for any person, acquainted with the most common electrical phenomena, to doubt that a mutual action of the material parts of bodies and of the electrical matter, whatever it was, existed; to him it appeared that the very first electrical ex-

periment performed by any tyro, the excitation of a glass tube by friction upon another substance, (suppose the cloth of a person's coat,) proved the fact without any possibility of further question. How else were the electricities separated, except the one kind was more forcibly drawn to the glass, and the other to the rubbing or exciting substance? Dr. Ritchie then inquired whether Mr. Harris had not stated, that there were many cases where the electrified body did not attract a distant non-electrified body with forces reciprocally proportional to the square of the distance.—Mr. Harris replied, that the law of the inverse of the square of the distance was invariably found to prevail when the one body was electrified and the other neutral; but when both were electrified, the law presented itself under a great variety of aspects, as related to the absolute amount of the electrification, the relative amount of the electrification on each body, and the distance at which they were placed from each other; and when these circumstances were given or known, the resulting attractions could be inferred with the utmost certainty from his rule.—Dr. Ritchie mentioned some facts tending to show that the law of the inverse square did not hold in some cases of an electrified body brought near an unelectrified one; as, for instance, when they were brought very near, and the tension of the electrified body was considerable.—Professor Stevelly stated, that, in his opinion, the meaning of the law of the inverse square of the distance was somewhat misunderstood; it only meant that the attractions and repulsions between the elementary molecules of the electrical fluid followed the inverse law; but it was not from thence to be inferred, that in every case the total amount of the attraction or repulsion between bodies, no matter what their shapes, distance, or relative electrical tensions might be, would vary according to the same law: even the law of gravity could not bear this interpretation, for it was not for bodies of every shape, but only for a few bodies of regular shapes that the total amount of gravitation was as the inverse squares of the distances of centre from centre. The Professor felt no doubt, that if this view of the matter were followed up by some person possessing the mathematical skill, and the acquaintance with the subject possessed by the learned President, Professor Whewell, a complete accordance would be shown between theory and the facts stated by Mr. Harris and by Dr. Ritchie; as an example, two gravitating spheres attracted reciprocally as the square of distance from centre to centre, because the attracting molecules were held by cohesion or mutual attraction to their relative places; but not so when two unequally electrified spheres were brought to several distances, for the induction generated caused the elementary molecules to change their places, and thus what Professor Whewell would call a meniscus of electrical particles would be accumulated on each opposite side of each body; and the very shape of the arrangement of the attracting or repelling molecules would be changed from a spheric shape to many other forms; and even the very distances of the elements were changed; no wonder, then, that the law of the inverse square of the distance should no longer hold in all varieties of these changed shapes. The Professor further stated, that he had examined the principle of Mr. Harris's balance, and found that it admitted of a very simple mathematical investigation; its type, the balance, with one pair of parallel threads, without the small bits of corks interposed, indicated, until the strings crossed by turning round, a force proportional to the sine of the angle through which it was twisted. The law of the actual force could be inferred readily from this.—Mr. Whewell confirmed the statement of Professor Stevelly as to the strict agreement between Mr. Harris's observations and theory, when rightly understood; that agreement he was not at the moment ready to admit at the Dublin meeting; but he had since examined minutely many of the experiments, and in every instance where theory could be at all applied he found the harmony most surprising. As an example, he selected the experiments of Mr. Harris upon the proof plane of Coulomb, as a proof of the manner of distribution of an electrical charge over the surfaces of bodies; that the proof plane should give no indication of a charge which yet existed on the inside of a hollow sphere, was a direct and necessary consequence of theory. Again, Mr. Harris's beautiful experiments, comparing the action of the proof plane with that of cylinders of equal diameter but various thicknesses, upon an electrified circular plate, was not only a necessary consequence of theory, but so obvious a consequence that a diagram would illustrate the harmony to the meanest capacity. This he showed, and clearly and simply explained. The learned President concluded, by instituting a comparison between the electrical forces and gravity, pointing out the cases in which the entire resulting effects were analogous, but showing many instances in which an attempt to push the analogy too far would lead to the most serious error; the mobility, for instance, of the molecules, and the fact, that whether there were two fluids or not, electrical effects were capable of both attraction and repulsion, just as would happen if there were two; nothing like this could be maintained respecting gravity.—Dr. Hare inquired, whether Mr. Harris considered the divergence of the gold leaves of the electrometer when electrified, to be an example of repulsion?—Mr. Harris answered, he supposed every electrician of the present day admitted that it was repulsion.—Dr. Hare stated, that he was convinced that it was not repulsion, but the attraction of surrounding bodies on the air; he detailed many experiments which, as he thought, required to be explained by the principle he advocated, and which he affirmed to be inapplicable on the supposition of repulsion. The learned Doctor frankly admitted, that an unwillingness to abandon the Single Fluid theory of his great countryman Franklin, made him more ardent in opposing this error.—Mr. Harris, in reply, admitted the correctness of the views respecting the proof plane and cylinder, so ably given by Mr. Whewell; but he mentioned other experiments with plates of mica and some other substances, which he could not perceive to accord with the theory advocated by Professors Whewell and Stevelly; but he would put the entire dispute to one simple issue. Here is, said he, an entire globe of brass and a hollow spheric sector. I shall place these at several distances successively, and I shall, by the aid of the unit jar, electrify each, to known, though very different degrees of intensity. Can you, Professor Whewell, predict by your theory the attractions or repulsions which result, and reduce them to grain weights?—Rev. Mr. Whewell: No!—Mr. Harris: But I can; and now, which is better, your theory, which cannot anticipate the phenomena when the preceding conditions are known, or my rules derived from observation, which can?—Rev. Mr. Whewell: If the only use of theory were to anticipate the exact numerical attractions or repulsions in a few isolated instances, when certain conditions were given, he would not consider it worth a rush. The great use of a correct theory was to classify the phenomena, and to deduce general laws, which, being unfailing, would doubtless be fruitful, and lead to anticipate unknown and previously unsuspected relations and phenomena. But he would grant to Mr. Harris, that if he can once show any theory to be contradicted in even one instance by a fairly-interpreted experiment, that theory must be at once abandoned. The indications of nature, as established by the Lord of the Universe, must, with implicit reverence, be bowed to as final.

The President called upon Professor Challis for his 'Supplementary Report upon the Mathematical Theory of Fluids.'

Professor Challis, in so low a tone of voice as to preclude the possibility of our doing him justice, stated, that the report which he now laid before the British Association, was supplementary to two former reports upon the same general subject. The report which he had the honour of laying before the Meeting at Oxford, was the Analytical Theory of the Equilibrium and the Motion of Fluids. The report made by him to the Edinburgh Meeting, related to the Molecular Actions and Constitution of Fluids. The present report referred chiefly to the Mathematical Theory of Elastic Fluids, and divided itself under two heads—1. The constitution of the atmosphere; 2. The velocity of the propagation of sound, as affected by the developement of heat. It appeared by a review of the attempts made to determine by theory the relation of the temperature of the atmosphere to its density, that they had not been successful; and he called the attention of gentlemen engaged in these inquiries, to a law deduced by the late Mr. Atkinson, of Newcastle, from observations merely. According to this law, the decrements of temperature during an ascent into the atmosphere, are equal for increments of height in *arithmetic progression*. This law draws with it another, viz. that the temperature of the atmosphere in its mean state, varies as the Naperian logarithm of the density. The Professor stated, that he had himself recently arrived at this latter result, on purely theoretic grounds, and considered it highly probable, to say the least, that it is exactly the law of nature. The correct determination of the heights of mountains by the barometer, and of the amount of astronomical refractions near the horizon, are materially dependent upon the verification of Mr. Atkinson's law. Upon the second head, the learned Professor proceeded rapidly to point out the manner in which the velocity of sound was affected by the heat generated by the pulses of the vibrating air. He stated the results of the calculations of Laplace, and experimental Researches of Gay-Lussac. He gave the mathematical formulæ, traced their results, and compared them with the most accurate experiments. He then rapidly glanced at some of the principles of the propagation of pulses in air, and compared them with the vibrations in water.

Dr. Ritchie asked whether, if the pulses, when advancing, condensed the air before them, and developed heat, the receding pulses did not cause just the same amount of rarefaction, and thus generate an equal fall of temperature.—The President stated, that he believed it was a rule of Sectional proceedings, not to permit questions to be put upon the presentation of a Report made at the request of the Association, and he gave a good reason for this rule. It was, however, with much reluctance that he rose to prevent the very interesting question of Dr. Ritchie from receiving the notice from Professor Challis which it deserved.

The President then called upon Professor Stevelly for his 'Illustration of the Meaning of the Doubtful Algebraic Sign in certain formulæ of Algebraic Geometry.'

Professor Stevelly stated, that he had some years since been led to see the importance of the present subject, as bearing upon the determination of geometric positions by algebraic symbols, by observing, that in the transformation of co-ordinates, it was sometimes requisite to use the positive sign for a perpendicular from a given point, upon a plane given by its algebraic equation, while sometimes you found yourself obliged (you could not, as he conceived, intelligibly tell why) to use the negative sign; nor did he ever meet with a rule which would infallibly direct the choice, or that was satisfactory to his mind. This induced him to consider attentively the origin of the doubtful sign in this and similar cases, and the geometric meaning of the one sign and of the other. And he now showed to the Section the result of that inquiry in the simplest case, namely, the value of a perpendicular upon a line, given in position by its equation, from a point given by its co-ordinates. This perpendicular is at length found to have a double sign, and the question is, why? This question he answered, by supposing the given line to revolve slowly round a point in it, supposed to be fixed, and in each successive position, the value of the perpendiculars to be successively attended to; then arbitrarily supposing the first value to be, say positive, when the line has passed through the point from which the perpendicular is supposed constantly to fall, the perpendicular passes through a cipher value and becomes negative; the law of continuity then compels you to assign a negative value to each succeeding perpendicular; when at length the revolving line has passed through a semi-revolution from its first position, it becomes geometrically confounded with the line from which you set out, and the algebraic equation of the one becomes identical with that of the other, while now you are compelled to suppose the perpendicular to have a negative value, while the perpendicular with which you commenced, from the same point on the

same line, had a positive sign,—the very thing that its algebraic value denotes, and the very thing we wished to account for. This explanation led to considering every line in space, as well as the axes of co-ordinates algebraically considered, as having two faces; all perpendiculars upon the one face being positive, all upon the other negative; and thus was given a key to the meaning of the doubtful sign in many cases in algebraic formulæ connected with geometry. Professor Stevelly gave some other examples of this meaning.

Sir W. Hamilton was sorry to differ from his friend Mr. Stevelly, but to him it appeared that the explanation given by the Professor, of the doubtful sign, was inadmissible. That explanation led to the conclusion, that every line had two faces, one a positive face, as it might be called, the other a negative face. In order to arrive at this conclusion, it was necessary to suppose the line to revolve in the place of the co-ordinates, from its first position to one attained after a semi-revolution; now to him it appeared that if you supposed the line to revolve upon its own axis, it would present in succession, to the point from which the perpendicular was to be let fall, an infinite number of faces; and how were these perpendiculars to be distinguished from one another? To him it appeared that the true explanation of the dubious sign in this and other instances, could be arrived at more simply; for when the original value of the numerator of the value for the perpendicular was positive, he would take the positive sign for the perpendicular, but when that value was negative, he would take the negative sign. To this Mr. Stevelly replied, that neither algebra nor geometry gave you any means of distinguishing from one another the several successive positions of a line revolving upon its axis, and, therefore, no such diversity of the algebraic signs of the perpendiculars let fall upon the line, was to be expected, nor consequently were we to attribute to the line the innumerable faces which the learned Professor supposed. Were we by the analysis led, which we were not, and could not be, to an innumerable succession of values of the perpendicular, all equal in length, but distinguished in some such way as the positive and negative signs distinguished lines, then Professor Stevelly would interpret the values as Sir W. Hamilton did, by the revolving of the line on its axis. With respect to Sir W. Hamilton's own explanation, Mr. Stevelly appealed to the learned President and to the Section, whether it did not just amount to this. You meet with a quantity under a doubtful ($\pm$) sign, which in any case are you to assign to it? When it is plus, answers Sir William, take it plus—when minus, take it minus; if this were not begging the question, he knew not what was.—Mr. Peacock thought, that the question of the doubtful sign had been unnecessarily mystified by the explanation submitted to the Section by Professor Stevelly. In this subject, everything regarding the sign to be attached to a line was arbitrary in the first instance, for it was not until you had arbitrarily assumed that lines measured upon one side of the axis of x were positive, that you were led to assume those upon the other as negative. A similar remark applied to the axis of y, to the axis of z, and, as he conceived, to all lines; to this it was, as related to the possible modes of geometrical construction, that the doubtful sign referred; when you let fall the perpendicular from the given point, upon the given line, you had one sign belonging to the length of the perpendicular; when you drew the perpendicular from the line to the point, you had the other sign for the perpendicular.—Professor Stevelly agreed cordially with all that Mr. Peacock said in the early part of his remarks,—indeed, they were the very groundwork of the explanation given by Mr. Stevelly. But from the latter remarks he was most reluctantly compelled entirely to dissent. If a line was to have two differing signs, according as you geometrically laid it down, by beginning to draw it from the one end or from the other, then, since every finite line must have two ends, every line would meet us with a double algebraic sign, which was not the case; and if it had been the case, there would have been no possibility of distinguishing the abscissæ upon the positive side of the axis of x, or y, or z, from those upon the negative side. He still felt confident that the explanation he had given was true and valuable, and he would leave it for the more deliberate consideration of the friends who now dissented from it.

Professor M'Cullagh then made a communication respecting the laws of double refraction in crystals of quartz. He commenced by bestowing an eulogium upon the experimental researches of Sir David Brewster, in this as in other branches of optics: had it not been for the experimental researches of Sir D. Brewster, the undulatory theory of light must have been deprived of the strong confirmation which it received from the labours of mathematicians such as Fresnel and Cauchy, many of whose calculations had for their basis the experimental discoveries of the Vice President. He then stated, that the singular laws of the double refraction of quartz had arrested his attention, because these laws, discovered by the successive researches of Arago, Biot, Fresnel, and Airy, are known merely as so many independent facts, and had not, as yet, been connected by a theory of any kind, although they may be all grouped together by means of a very simple mathematical hypothesis. He, therefore, proposed to show, that these laws may be explained hypothetically by introducing differential co-efficients of the third order into the equations of vibratory motion. Besides explaining all the laws already known, this hypothesis leads to a new and very remarkable one, which has long been a desideratum in optical science. This new law enables us to connect two classes of phenomena, between which no connexion whatever had been previously known to exist, although experiments upon both had been instituted by Biot and Airy. This law is of such a nature, that the experimental result of Airy can be computed by the aid of the new theory, solely from the data furnished by Biot: an agreement altogether surprising is found between the results thus calculated and the experiments.—In order to make these remarks intelligible to such members of the section as were not familiar with the undulatory theory of light, or the theoretic explanations of double refraction, he began by explaining the elementary views on these subjects entertained by the philosophers engaged in these speculations. The ordinary undulations of a wave of light were now admitted to arise from the inconceivably rapid back and forward motion of each particle of the luminous æther through a most minute line, perpendicular to and extending to both sides of the course of the ray of light, thus causing the wave to be of this form:—

the dotted line being the sensible course of the ray. He then proceeded to show how each molecule might be made to revolve round the sensible course of the ray in a circle; and, in this circle, the motion might manifestly be either from the left to the right, or from the right to the left, thus affording an origin for right-handed and left-handed circular polarization: yet, farther, the molecules may describe elliptic curves, and this also with the distinction before mentioned, and thus afford right-handed and left-handed elliptic polarization. Now, these motions have been reduced to differential equations, in which it has been heretofore deemed unnecessary to introduce differential co-efficients of a higher order than the second; and, consequently, some of the more curious experimental facts determined by Sir D. Brewster, and the laws investigated by the distinguished philosophers whose names he had before given, had not, as yet, been shown to be results of the undulatory theory. The learned Professor found that, by adding a term involving a differential co-efficient of the third order, he could reduce these facts to the undulatory theory. He then proceeded to give and explain the formulæ, and how, from experiments, to deduce the numerical values of certain quantities which they involved; and he stated the surprising fact, that the numerical value of C (the co-efficient of the term which he proposed to introduce into or add to the commonly-received equations of vibratory motions), is about twenty thousand times less than the millionth part of an inch. He showed, that when these equations are applied, as in quartz and other biaxal crystals, there will be two waves elliptically polarized, and moving with different velocities; the ratios of the axes (or greatest and least diameters) of these ellipses being the same in each wave: but the greater axis of one being turned towards the lesser axis of the other, and the difference of the sign of the two equal quantities, corresponding to the ratio of these axes; showing that, if the vibration be from left to right in one wave, it must be from right to left in the other, a law which M. Airy had discovered. He then proceeded to show the conformity, which, in some instances, was most precise, between the conclusions which were the result of calculations founded upon his extended formulæ, and the experimental results of Biot, Airy, &c. The Professor then explained to the Section how he was led by comparing the successive steps of the experimental researches of these philosophers, to conceive the idea of adding this term to the differential equations of vibratory motion, most clearly showing that the addition of such term was not a mere arbitrary guess on his part, but one to which he was, as it were, compelled to resort, although he owned, in conclusion, that the physical or mechanical origin of this term, or the circumstance in the vibratory motions from which it resulted, he had not been able to divine; and to this subject he begged earnestly to call the attention of those members of the Section who were engaged in these pursuits.

Sir D. Brewster, after complimenting Professor M'Cullagh for his happy exposition of this most important step towards completing the mathematical theory of undulations and polarization, proceeded to give some hints to the gentlemen engaged in these speculations for determining the numerical co-efficients referred to or concerned in the theoretic determinations of Mr. M'Cullagh; these related to the fixed lines in the solar spectrum, and appeared very much to interest the scientific gentlemen near Sir David Brewster; but, from the very low tone of voice in which he spoke, we could not catch their import. Most probably they related to an apparatus, devised by Sir David, for rendering the fixed lines distinct and readily recognizable, and which apparatus the learned gentleman described on Friday, to our report of which day's proceedings we must refer for a detailed notice respecting it.

Mr. R. Addams then made a communication on the interference of Sound, and illustrated his subject by several experiments.

His first observation was on the total destruction of two sounds when the waves occasioning them meet at right angles to each other. Thus, with two tubes, each capable of reciprocating to a tuning fork, one placed vertically, the other horizontally, and a fork, in a state of vibration, held in a particular way between the two unclosed ends of the tubes, no sound was heard; but if one tube were removed, or had its mouth closed, a very audible effect took place.

He also proved, that a tuning fork, vibrated over the centre of the orifice of a tube, and held with the plane passing through both its branches, so as to be parallel or at right angles to the mouth of an unisonant column of air, and which gives, in this position, a sound of maximum intensity, yields no sound when the plane is at an angle of 45° with the axis of the tube; but if the last-named direction of the fork be maintained, and then transferred to the edge of the pipe, a sound is distinctly reciprocated.

Mr. Addams then showed a modification of the arrangements, so as to separate, as much as possible, the compound action of the motor of sound—this consisted in employing a disced fork and open resonant tubes. Thus, a tube of fourteen inches long had another, of equal length and open, or of half the length and closed, attached at right angles to its centre, and the interference took place in this apparatus also, by the systems of undulæ meeting each other rectangularly at the section where the two axes of the pipes intersected. An extraordinary phenomenon was exemplified—namely, that a hole *may* be opened in the side of a sounding pipe at its centre, or place of principal *node*, and the pipe continue to yield its tonic note, and that too with considerable force, although this effect had always been considered impracticable, and contrary to theory.

In order to demonstrate this, the author employed a pipe of such length as to reciprocate to a tuning fork, and then showed that a hole opened at the middle of its side destroyed the sound, but that when he inserted a tube into the side hole, varying in length from two and a half to five inches, the air in the main pipe gave a very loud sound, notwithstanding the added tube was open at both ends—proving, that if a pipe be very thick, in wood or metal of the same pitch, a hole may be opened at the place of alternating maximum condensation and rarefaction, and the sound still continue.

The Chevalier Mascarenhas (the Portuguese Consul residing at Bristol,) expressed the extreme pleasure these beautiful experiments gave him, and asked for some explanation from Mr. Addams respecting the effect of opening wider or narrower the side tube, or using a material which itself vibrated, as metallic, or not.—Mr. Addams replied, that these circumstances did not appear to be essential, since it was upon the pulsation of the column of air that the effect depended.—Mr. De Butts, of Dublin College, inquired whether these experiments could be useful in throwing light upon the manner in which the larynx aided the production of various sounds, in the mechanism connected with the human voice.—Professor Forbes would not delay the Section at this late hour by offering any explanatory remarks upon Mr. Addams's experiments. With respect to the question asked by the last speaker, he could mention an experiment which bore very strongly upon the use of the larynx. It was this: a piece of parchment being strained over a hole in the side of a tube, properly prepared for producing resonance, this parchment being wetted and suffered to dry by evaporation, a series of effects upon the sounds was produced, varying from the lowest that could be heard to the full musical note, thus clearly evincing the value of that power of the larynx, by which its tension can be altered.

Section B.—CHEMISTRY AND MINERALOGY.

Dr. Daubeny commenced the business of the day by reading an able and very elaborate Report on the subject of Mineral Waters. It would be impossible to give within a narrow compass anything like an adequate idea of this communication, embracing as it did so many details and such a variety of topics. Their temperature, chemical compositions, and manner of action on the animal body, were successively discussed, and the sources also from whence are derived their component parts—both those of an organic, saline, and gaseous nature. A number of collateral questions of high interest were brought under consideration, such as the cause of the elevated temperature of thermal waters, the sources of the organic materials which they sometimes include, of their sulphuretted hydrogen and carbonic acid, and the manner in which the air of thermal waters is deprived of its oxygen. In the course of the reading of this paper, an instrument was exhibited for bringing sea water from different depths. (See Section G.) Dr. Daubeny concluded with an enumeration of the various doubtful but important questions connected with the history of mineral waters, and with a list of the most valuable British and continental works which have been published on the subject.

Mr. Mushet then exhibited some specimens of malleable iron, which he prepared by a peculiar process, and gave an exposition of the views which he entertains in reference to the theory of smelting as usually conducted. The iron, when first reduced in the upper part of the furnace, is in the malleable state, but, in its progress downward, it is, in virtue of exposure to a higher temperature and the redundancy of charcoal it encounters, converted first into steel, and finally into pig metal. His own process consists in submitting the ore to the actions alone which it experiences in the upper part of the furnace,—that is, in restraining the heat, and furnishing but a limited supply of carbon; and operating by such method, and without the use of lime, he stated that he was able to obtain at once, and by a single process, iron soft enough to admit of being forged into nails. Mr. Mushet also described a new variety of water cement, differing from those ordinarily manufactured, in the circumstance of the iron being present in the metallic form.

Professor Johnston was the author of the next paper, which related to the discovery, by him, of a new isomeric body. When procyanide of mercury is heated, cyanogen, as is well known, is given off, and a black substance remains behind. Now as, when the salt is perfectly dry, the gas given off is altogether absorbed by potash, and therefore perfectly pure, Mr. Johnston long since concluded that the residual black substance must have been itself a cyanogen, or, in other words, a substance isomeric with that well-known compound. This opinion he communicated to Mr. Liebig, in an interview he had with that eminent chemist, and induced him to undertake its analysis. The event proved the correctness of his previous conclusion, and upon returning from the continent he repeated the analysis of Liebig, and arrived at critically the same results. This para-cyanogen, as it would be called by Berzelius, may also be obtained in other ways. When cyanate of silver is heated, para-cyanogen remains commingled with the metal. When strong prussic acid undergoes spontaneous decomposition, a black mass is deposited; and one of a similar description falls when ammonia or potash is added to an alcoholic solution of cyanogen. Both these dark deposits are convertible by heat into para-cyanogen. Para-cyanogen is a very stable compound, but is converted into cyanogen by an elevated temperature, or by heating it with potassium—with which it unites—giving rise to the ordinary cyanide of that metal. Professor Johnston entered into a variety of further details in reference to this new isomeric body, and in particular described and illustrated a mode of converting it into a peculiar acid, which he called, though we think improperly, the Paracyanic Acid. This term we think objectionable, inasmuch as it would convey the idea that the new acid was isomeric with the cyanic and fulminic acids, whereas such is really not the case. This paper may be described as novel, interesting, and important, and would undoubtedly have been more effective, had the author abstained from annexing to it a number of statements of, as far as could be collected, a purely gratuitous and hypothetical description.

Mr. West next read a short paper, the object of which was to suggest a new mode of determining the presence, and estimating the amount of those materials which constitute but small fractional portions of the atmosphere. His proposition was, that instead of operating upon a limited volume of air, as is usually done, a very large quantity of it should be made by mechanical means to pass through appropriate fluids—such as barytic water for carbonic acid, and nitrate of silver when the object was to determine the presence of muriatic acid.—Dr. Dalton stated that he had for many years turned his attention to the amount of carbonic acid in the atmosphere, and that he had satisfied himself that its average quantity was 1 part in 1,000. He altogether rejected the recent results of Saussure, and contended that the quantity of this gas in the atmosphere was constantly the same in town and country; and that even in a crowded theatre it seldom rises to 1 per cent.—Dr. Thomson gave it as his opinion, that a fall of rain diminished the amount of carbonic acid in the air, and expressed surprise that Dr. Dalton should maintain an opposite tenet.

The business of the day was concluded by Dr. Hare reading a pamphlet on the Berzelian nomenclature, which he addressed some years since to Prof. Silliman.

Section C.—GEOLOGY AND GEOGRAPHY.

Dr. Buckland in the chair.—Mr. Stutchbury read a paper on some newly-discovered Saurian Remains, from the Magnesian Conglomerate of Durdham Down. This communication chiefly related to the specimens exhibited to the meeting, and contained a number of minute anatomical details, which testified in a high degree the industry of Dr. Riley and Mr. Stutchbury, who had examined the specimens; but it would be impossible, without plates, to convey to the reader any accurate notion of these highly-interesting organic remains. They were found in the magnesian conglomerate that rests upon the limestone, and they must have been deposited upon the spot where they were found without violent action, as they bear no marks of attrition; they are often injected with the rocky paste, which has been originally of a viscid character, from its containing blocks of limestone suspended, even near to the surface, and bones have been found near the bottom. Perhaps the most interesting fact mentioned was the peculiar structure of the vertebræ of the newly-discovered saurians, which, from their deeply concave structure, presented a remarkable contrast to those of the recent crocodiles. He showed a singular gradation from the recent saurians to sauroid fishes, by means of this arrangement of vertebræ, which became an excellent guide in the discrimination of the genus of Saurus; and he concluded his communication with a quotation from Agassiz, respecting the progressive developement of animal life.

Dr. Riley alluded to the extraordinary structure of the cerebral column of these extinct saurians, as likely to illustrate the supposition of Dr. Gall, that the spinal matter of vertebrate would be eventually found to correspond with the ganglionic system of invertebrate animals.—Dr. Buckland was particularly struck with the singular structure of these vertebræ, as indicating in the animal a nervous power of the most extraordinary character. He referred to the extreme interest now excited over the whole globe in the subject of organic remains. He mentioned with great praise the exertions of Lord Cole and Sir Philip Egerton, in devoting their time and money to the forming extensive collections of these remains; and he particularly cited the instance of Bristol, as having at so early a period been distinguished in possessing individuals, who have formed collections of very great value. He mentioned the cabinet of Mr. Johnstone, which contained many specimens inestimable from their great rarity, and of which he had availed himself in drawing up the Bridgewater Treatise on Geology. He spoke also of the collection of Mr. Mantell, of that gentleman's immense exertions in the investigation of fossil animals, in particular of the Iguanodon, the gigantic size of the bones of which exceeded any idea we could form, by comparison, with animals now existing. He gave some valuable observations on the specimens described by Mr. Stutchbury, on the form of the teeth and claws of saurians in general. He agreed with Mr. Stutchbury in supposing these remains had been deposited in an undisturbed state, as they bore no marks of violence or rubbing. He spoke of the organic remains of the Keuper of Germany, a formation of the same age as the conglomerate under consideration; a magnificent collection of which is at Stutgard, and he brought before the notice of the meeting the Palæologia of Von Mayer, as containing the fullest account, kept up to the present hour, of the discovery of organic remains. It was desirable to search all the formations for fossils, especially as no saurians had been found in the Carboniferous system, and the specimens before the meeting were almost the first discovered in the system of the new red sandstone; he had known of one example only, near Warwick, before the present discovery.—Other specimens, it was stated by a gentleman present, had been found in Warwickshire, and it was also mentioned that a saurian had been seen in the roof of a coal mine near Nottingham: of this fact the members seemed desirous of possessing more certain information. A rib of one of the Bristol rioters, mineralized by lead, was then exhibited, and drew forth from Mr. Conybeare an announcement of the existence of similarly mineralized bones at Axminster, in the church wall. Dr. Buckland said, they also had been found in repairing part of Christ Church, Oxford. Some antiquarians had supposed the Saxons had a practice of so preserving the bones of their distinguished men, but it was not impossible they might have been the result of accident, as in the case of the Bristol rioter.

A paper was then submitted by Mr. Hopkins, affording theoretical views of the phenomena of elevation, in which he brought forward a series of observations of the highest importance to science in general, and to geology in particular. He entered into the consideration of the mineral veins of Derbyshire, which were fissures filled with mineral matter, with regard to their directions; and the result of his examination of them had been of the most astounding character, namely, that the direction of the axis of dislocation, which had caused the fissure, was true north and south, while that of the structure of the rocks was *magnetic* north and south, thereby showing

the connexion between magnetism and the theory of mineral veins. Geology thus came into contact with physical science, and was evidently on its way to a point where it might come within the dominion of the more exact sciences. The mode by which he had obtained this induction, it is not easy to represent without entering into general physical science; but not only did the direct examples confirm the theory, but it was also proved by the exceptions; as in case of a mountain turning aside the force of elevation, and causing the dislocations to radiate from a point in the original axis. He regarded the original structure of a dislocated country, as pointing out the immediate cause of the direction of the fissures when these coincided with certain lines of structure, which indicated that the mass was weaker in certain parts than others, and that the phenomena of anticlinal lines could be readily explained by the same theory, as well as several phenomena of complicated dislocation.—Mr. Sedgwick considered this as the most important communication as yet made to the Section. We should now be enabled to indulge in the same speculations in Geology, as in her elder sister science Astronomy, and from the beginning now made, it was impossible to predict how far investigations like Mr. Hopkins's might eventually be carried. The observations of Mr. Hopkins held true in Cumberland, Derbyshire, and Flintshire; and some of his cases of complicated dislocation were admirably illustrated in Carnarvon and Stainmore. Mr. Sedgwick had himself paid particular attention to the joints of rocks, and had found them connected both with their strike and dip. He had also observed some singular phenomena in the Westmorland slates; he had seen in them two sets of joints, and in the cleavage, which was in a different direction from the jointing, there was a limit beyond which no farther division could be made, unless in certain cases. In South Wales the planes of splitting were in one direction with very few exceptions.—Mr. Phillips expressed his high satisfaction at the result of Mr. Hopkins's paper, and stated his ardent desire, that the phenomena of geology could be explained by such simple laws as regulate the other branches of physical science. There was now some hope of resolving the problem, "what is the state of the interior of our planet?" With regard to the structure of rocks, which promised to throw so much light upon the subject, he proposed a new term for it, the *symmetrical* structure. In the examination of rocks under the three classes of Calcareous, Arenaceous, and Argillaceous, he had remarked, that the regularity of the structure increased with the antiquity of the rock, which was well exemplified in the older slates and limestones. For this there must be a cause, and this must be a central heat, which has been most excited upon the older formations, and least upon the new. Illustrations of the effects of heat upon strata may be obtained from those in contact with dykes, which produce symmetrical structures in rocks or clays through which they pass. Internal heat must then have caused the regular structure so generally observed in rocks. The direction of the fissures pointed out by Mr. Hopkins in Derbyshire, corresponded with the observations of Mr. De la Beche in Cornwall, and of Mr. Conybeare in Glamorganshire. The phenomena of the direction of the joints were well worth investigation, as there was much uncertainty involved. They evidently pointed out the weaker points, or places of least resistance, where the disturbing force would operate with most effect; and they may have been the result of consolidation, as we find them in conglomerates, as well as in homogeneous rocks: still it might be a question, if they were formed before or after dislocation.

Section D.—Zoology and Botany.

Col. Sykes made a communication to the Section 'On the Cultivated and Wild Fruits of the Deccan.' The materials from which the substance of the present communication was selected consisted of a folio manuscript of descriptions, with coloured drawings of most of the species, accurately reduced to a particular scale. In a statistical survey which he had made of the Deccan, he had an opportunity of making a very complete examination of the various products of its agriculture, and had collected an account of every fruit, both cultivated and wild, which grew in the province. He had identified most of these with a catalogue contained in some ancient books which he had met with in India, and his manuscript contained the Mahratta, Sanscrit, and Hindoostanee names of many of them. Where the Sanscrit name was wanting, the probability was that the fruit was not strictly indigenous. The cultivated fruits, of which several were natives, amounted to forty-five, and those which were met with only in a wild state amounted to twenty-one. Some remarks were made as to their times of flowering and fruiting, their uses in the arts, and the medicinal qualities which many were asserted to possess according to the Hindoos. He further alluded to several of the religious ceremonies and ideas with which some of these plants and their products were associated. The Annona, Anacardium, and Carica, generally held to be natives of the Western world, are universally cultivated in the Deccan. He described a plant, which he supposed might be the original of the whole Citrus family, which abounds in the wild state along the western parts of the country, and assumes the form of a good-sized tree. The wild nutmeg also becomes a noble forest tree about the source of the Becara river. Of three kinds of mulberry one appeared to be entirely new, and the Deccan afforded a fine field for the culture of these trees and the profitable production of silk.

Mr. Mackay read the Report which he had been last year requested to prepare, 'On the Geographical Distribution of the Plants of Ireland.' This contained a catalogue of 195 of the more remarkable species, with a comparative view of such as were common to the neighbourhoods of Dublin, Edinburgh, and the south coast of Scotland. And Mr. Mackay then entered into some details illustrative of the more remarkable points of difference in the vegetation of Ireland and Scotland. This difference might be partly ascribed to the more southerly situation of Ireland, and the height of its mountains being inferior to those of Scotland. Its greater exposure to the influence of the western ocean gives it a moister climate. Scotland is, in consequence, much the richer in Alpine plants, and Mr. Mackay enumerated fifty-five species of the more remarkable Alpine and other plants natives of that country, which do not occur in Ireland. Many plants on the western coast are natives of the mountains of Spain and Portugal. A list was then given, in which twenty-one species were enumerated as natives of Ireland, but which had not been found in any other parts of Great Britain, and it was very remarkable that several of these were also to be met with on the western side of the Pyrennees. In conclusion, Mr. Mackay proposed to continue his observations, hoping to present the Association with a more perfect list on a future occasion.

Professor Royle read a communication on Caoutchouc. He stated, that he had been induced to draw up the substance of the present communication in consequence of a conversation which he had lately held with the director of an extensive establishment for the manufacture of this substance into various articles of commerce, from whom he learned that the demand at present exceeded the supply. Professor Royle asserted, that, in the East, there might be any quantity of the article procured from a great variety of plants, if the natives could only be induced to collect it with sufficient care. The South American caoutchouc is generally collected with so much greater care than that from the East Indies that it bears a very much higher price in the market. That from the latter country is of excellent quality, but generally much mixed with a considerable quantity of dirt, bark of the tree, and other extraneous matter. Professor Royle then enumerated several of the uses to which caoutchouc is now applied, and stated, that the East Indian kind, from its great impurity, can only be used for the purposes of distilling from it the volatile spirit Caoutchoucine. At the present time, the article from the East is selling at 2*d.* per pound, whilst that from Para fetches from 2*s.* 6*d.* to 3*s.* per pound. It is very remarkable, that a substance so incorruptible in water, and so insensible to a variety of chemical re-agents, should have remained so long unknown in Europe. Professor Royle then recapitulated the chief circumstances of its early commercial history, and the method employed for procuring and preparing it. The substance is probably also produced in the southern parts of China, and is now exported from the island of Singapore. The Mauritius, Madagascar, Java, Penang, were then instanced as other localities from whence caoutchouc was obtained, and a reference made to the manner in which it was prepared in the latter country. By experimenting upon other species of the same families as those which were known to contain caoutchouc, it would probably be found that the list of plants from which it could be obtained might soon be much increased; and Professor Royle then mentioned those families in which it had already been observed to exist in greater or less proportion. These were, the Cichoraceæ, Lobeliaceæ, Apocyneæ, Asclepiadeæ, Euphorbiaceæ, Artocarpeæ. It is remarkable, that many plants of the families which yield caoutchouc are characterized by the strength and tenacity of their fibre, and in tropical countries birdlime is prepared from plants of the same families. These observations, connected with the fact that the silkworm feeds on several plants of the families which yield the caoutchouc, though otherwise little allied to each other, induced Mr. Royle to suppose that this substance might possibly form a necessary ingredient in those plants upon which only they can feed, and that it was in some way employed in furnishing the material from which the tenacity was given to their silk. This induced him to inquire whether caoutchouc existed in their favourite food the mulberry, and a friend having analyzed the juices of this plant, substantiated the validity of his conjecture.

Mr. P. Duncan, after detailing some experiments of Dr. Harwood on the minute animalculæ upon which the luminosity of the sea at certain seasons depends, wished to know whether any information could be afforded as to the actual cause upon which the exhibition of the phosphorescent properties of these animals depended, and which he was inclined to believe was never exhibited except they were brought into immediate contact with the air.—And Col. Sykes expressed his conviction that, between the tropics, the luminosity of the sea-water continued after it was placed in a vessel, even though it was kept still, and needed not to be agitated to excite the phosphorescence.

Dr. Hancock read a paper 'On the Cow-fish, *Manatus fluviatilis*, of the inland waters of Guiana.' This is now rarely met with, except in districts far remote from European settlements. Two specimens which he had examined were less than nine feet in length, and might weigh about 800lb each. The female bears one young at a birth, rarely two, and this she carries under one arm hugged to her breast. He considered that it would be both easy and profitable to domesticate this animal in the shoal lakes of Guiana. Dr. Hancock detailed the characters of this species, which he considered to be distinct from any hitherto described.—Dr. Riley commented upon Dr. Hancock's account, and thought it doubtful whether this were really a Manati or Dugong. There appeared to be an error in Cuvier's description of the *Manatus Americanus*, to which he ascribed only thirty-two teeth, whereas he now exhibited to the Section a skull of this animal in which thirty-six were to be counted. The error had probably originated in his not knowing that the anterior molars dropped out as the posterior were developed. In the young state, there were two incisors in the upper jaw, and probably two also in the lower.

Dr. Macartney made some observations on the preservation of animal and vegetable substances from the attacks of insects. He employed a concentrated solution of equal parts of alum, nitre, and salt, mixed with an equal quantity of proof spirits and a little oil of lavender or rosemary. A forcible injection of this liquid into the arterial system would perfectly preserve a dead body for three or four months fit for dissection, and portions of one which had been thus injected, if rubbed over with pyroligneous acid, might be preserved for any length of time. He recommended a coat of plaster of Paris to be daubed over succulent plants as a mode of preserving them, and, when dry, this might easily be removed. He noticed the entire preservation of some bodies found in the bogs of Ireland.

Mr. Hope exhibited a collection of North American insects, principally Coleoptera, collected from the raw turpentine sent over to this country, in which they had become entangled. They were extracted from the turpentine whilst it was slowly melting at the warehouse, and then placed in spirits of turpentine to cleanse them thoroughly. In this way they may

be prepared in as great beauty and perfection as when they are captured in nature.

Section E.—ANATOMY AND MEDICINE.

Dr. Macartney read the report of the Dublin Committee, appointed by the British Association, 'On the Motion and Sounds of the Heart;' and the report of the London Committee, 'On the Sounds of the Heart,' was read by Dr. Clandining. Dr. Symonds then read a letter from Dr. Spittal, of Edinburgh, stating, that in consequence of the death of Professor Turner, and the absence of one of the members on the Continent, the Committee had not been able to prepare a report. After that a paper was read, 'On the Gyration of the Heart,' by F. A. Greeves. The following is an abstract.

1. Muscular fibres can act as levers without a *solid* fulcrum, if there be another set of fibres set at an angle, and contracting simultaneously.
2. A hollow organ may be *dilated* by the contraction of such an arrangement of fibres, if, in contracting, they become more parallel to a plane passing longitudinally along the axis of the organ.
3. That there are two spiral, two longitudinal, and one diagonal set of fibres in the heart, interlacing each other.
4. The ventricles gyrate incessantly to and fro upon their axes.
   a In systole or involution, as the left hand pronates.
   b In diastole or evolution..... supinates.
5. The double spiral curve of the two great arteries forms a compensating and regulating movement, causing
6. I. A diminution of friction.
7. II. Steadiness and celerity of motion, on the principle of the tilt hammer.
8. III. An isochronous action, on the principle of the balance wheel and spring.
9. IV. The progression of the whole heart.
10. That the function of the auricle is to maintain the equilibrium of the venous system.
11. The first sound is produced by the sudden tension and sudden change of gyration, occasioning vibration of the ventricular walls. The second sound is from the flapping of the sigmoid valves.
12. The impulse is partly caused by the progression, partly by the atmospheric pressure, and chiefly by the left ventricle, first *gyrating into the proper position to do so*, carrying the apex against the thorax with a force equal to the difference of strength between the right and left ventricles.
13. *Bruit de soufflet in the heart* is the result of increased friction on the pericardium.

Mr. Greeves gave the particulars of many experiments, in illustration of, and to enforce his somewhat novel theory.

Dr. Carson and Dr. Williams expressed their opinion that there was nothing in the facts stated that ought to influence or change the received opinion in regard to the dilation of the heart, which appeared sufficient to explain the phenomena.

The President then read a communication from Dr. Brewster, entitled, 'A singular developement of Polarizing Power on the Crystalline Lens, after Death,' and also a letter from the same, 'On Cataract, or a disease resembling Cataract,' which, if resisted in its earlier stages, the Doctor believed, from personal experience, might be overcome. For detecting this disease, which generally manifested itself between forty and sixty, the Doctor gave instructions, and further stated, that by attention to diet and regimen, and taking care not to study by night, he had been cured in about eight months. If the affection had not been checked in time, he entertained no doubt it would have ended in cataract.

Dr. Carson then communicated some 'Observations on Absorption.' After giving a short but perspicuous history of the discovery of the absorbent system, Dr. Carson proceeded to examine the question, much agitated at present, whether the veins act as absorbents. He contended that the veins only take up substances external to the vascular cavity which they form with the artery after they have been divided. He attempted to prove, that in all the instances in which the veins were found by the French physiologists to absorb, these veins had been injured; but that the lymphatics, lacteals, and imbibers of the lungs took up substances from sound surfaces. The recrementitious part of the system requiring to be discharged, found access into the veins; substances retained for the nutriment of the body were conveyed in the other class of absorbents. Hence two kinds of absorbents—one destined for nourishing, and the other for carrying off the waste of the body. In states of disease, and often in health, the lymphatics and lacteals become the vehicles of substances not fit for the repair of the system or for supplying healthy and necessary fluids. The recrementitious matter, or the waste of the body, entered the veins at their extremities, at the point at which they received the arterial blood, and converted that blood from the vermillion to the purple colour. This recrement was discharged in the form of air and vapour, by the mouth, in expiration. The blood having been subject, in the pulmonary arteries, to a diminished atmospherical pressure, and such an increase of heat as to cause ebullition under that pressure, discharged such substances as were disposed, in that condition, to assume the gaseous form. This is contended to be the source of all the air that is expired. The renovation of the substances constituting the animal frame, the author contends, is far more rapid than is generally believed. Thus, the process of putrefaction goes on more rapidly during life than it does after death; but the products are carried out of the living body before they become offensive to the senses. The recrementitious matter which enters the extreme veins, and changes the colour of the blood, serves an important part in promoting the motion of the blood. It forms a tide, urging the blood along the cavity of the veins, and prevents those vessels from being collapsed by the pumping of the heart. When the lymphatics, lacteals, or imbibers of the lungs absorb matters unfit for entering the arterial circulation, there exists a process for discharging these substances before they reach the left side of the heart. They pass into the venous blood, and are in the pulmonary arteries subjected to the same depurgatory process that the blood itself is subjected to, and are discharged by the breath.

Another important class of absorbents is constituted by the imbibers of the lungs. These are vessels which form a communication between the branches of the windpipe and the pulmonary veins. All the air that is taken in by breathing, is conveyed through these vessels directly to the blood. Hence the source of animal heat, and of a considerable share of the nourishment of the body. The air is made to enter the pulmonary veins in consequence of the elastic fibres of the windpipe resisting protension when the chest is enlarged, and would form a vacuum in the veins, which is prevented by the air passing into their expanding cavity through the imbibers. The author explained how the air that is inspired, and that which was expired, were mixed, though they passed through the same channel; but his argument was of so technical a kind as to be unfit for our report.

Section F.—STATISTICS.

In the absence of Sir C. Lemon, H. Hallam, Esq., Vice President, took the chair.—A paper on Statistical Desiderata, by W. R. Greg, Esq., of Manchester, was presented by the Rev. E. G. Stanley. The author complained of the great deficiencies in all the English statistical tables. In the population returns the census was less than the truth, it having been imagined that the government had some capitation tax in contemplation when it was resolved to number the people. Births and deaths were irregularly recorded; one source of error was, that children who died before baptism, were entered among the deaths, but not among the births. The bills of mortality were slovenly and incomplete; it was impossible to ascertain which were the months of greatest mortality, and in which the most fatal diseases prevailed. In the returns of marriages, no attempt had been made to ascertain the ages of the parties. The Criminal Statistics of the country, though greatly improved, were still deficient in classification. But the greatest errors were to be found in the Educational Reports, the formation of which were intrusted to overseers, who were at once ignorant and careless. The inquiries of the Manchester Statistical Society had shown that the returns made on the motion of the late Earl of Kerry, were erroneous to the extent of one-third of their total amount. He pointed out several errors in the Report made from these returns to the Statistical Society of London; particularly in the relative numbers of persons educated by Churchmen and Dissenters. The results of the labours of the Statistical Committee in Manchester had shown, that 46 per cent. were educated by Dissenters, and only 22 per cent. by the Church; and that the centesimal proportions of the Sunday schools, gave, in every hundred scholars, 60 educated by Dissenters, 30 by Churchmen, and 10 by Roman Catholics. He referred to Rickman's tables of illegitimate children as another example of the defective state of our Registers. He warned the members against putting entire faith in a mere array of figures, instancing a recent criminal report, gravely published by the corporation of Liverpool, in which it was stated that the annual value of stolen property in the borough was 700,000*l.*, the number of professed thieves 1,000, of occasional thieves 1,100, and of juvenile thieves 1,200; no data being given for these numbers. Now, the report was equally absurd and mischievous; for allowing 100*l.* a year to each of the occasional and juvenile offenders, it would follow that the average income of the regular plunderers was 470*l.* per annum, and that thievery was one of the most thriving professions in Liverpool. [The writer loses sight of the difference between the value of property stolen, and the price realized for it.] He recommended that means should be taken to determine the value of the statistical tables already in existence, which he feared was not very great.

Mr. Porter stated that he had sent 122 circulars to the parish clergymen in the county of Bedford, containing queries on agricultural statistics, and had only got 20 returns, though several months had elapsed since the circulars were issued. He directed the attention of the members of the Section to the questions circulated by the Statistical Society, copies of which were laid upon the table.—Lord Sandon was of opinion that accurate returns could only be obtained from persons who were paid for their compilation.

Dr. Lardner then rose to address the Section on some statistical results arising from the establishment of Railway Communications. The subject to which he would call the attention of the Section, was one which, at the present time, was particularly interesting; but it was not for the purpose of showing how far railway speculations, as such, might become profitable, that he should bring them forward—he had a higher object, which was that of endeavouring to ascertain, and if possible, to establish the general law which governed the increase of inter-communication which they led to. He was not prepared to lay before them any particular results, as to the general effects of railways; he should confine himself to a few facts which seemed to shadow forth the probability of a statistical law in reference to the point to which he had alluded. When the Liverpool and Manchester rail-road was projected, it was designed for the transit of goods only, at the rate of ten miles per hour; but it was unexpectedly found that treble speed was attainable, and then passengers became the primary consideration. Previous to the establishment of the railway, there were 26 coaches between Liverpool and Manchester, and the number of passengers making one trip was about 400 per day. Immediately on the establishment of the railway, that number rose to 1200; thus, in the very outset, an increase took place in the proportion of 3 to 1. The railway had been in operation, he believed, since 1828, and from that period the number of passengers had gone on increasing, with the exception of the period of the cholera, which might very fairly be omitted in his calculations, and now the number was 1500 per day, being a further increase of one in four; and thus it appears that no less than half a million travel by it annually. Now, the population of Liverpool was 165,000, and that of Manchester 183,000, making a total of 348,000, and thus they would see that, out of those populations, an intercourse of more than half a million took place annually. The time by the fastest coaches was three hours: the time on the first opening of the railway was, by the fastest trains, one hour and a half: now it was but an hour and twenty minutes. The fare of the coaches was, outside, half-a-guinea—what it was inside he could not then recollect: by the railway, the average fare was 4*s.* 6*d.* In this instance diminution of time and expense both combined to increase the number of passengers; and the increase, it should be borne in mind, was exactly fourfold. The second example he should refer to, was the railway between Newcastle and Hexham; before the establishment of which, the number of passengers by coach monthly was 1,700; it is now by railway 7,060, being rather more than a four-fold increase. Now, the village of Hexham was by no means an important place; on the contrary, it was

so insignificant that the wonder was, what could possibly require 7060 persons to go upon the railway. His third instance would be the Dublin and Kingstown railway. The city of Dublin contained 200,000 inhabitants, and Kingstown, which was distant about six miles, contained 6,000 or 7,000. There were no manufactures, no trade there: true, there was a harbour, but it was used exclusively by the Post Office packets; none of the commercial vessels—not even those who might be driven in by stress of weather—being permitted to discharge their cargoes: consequently no goods were carried on this railway. Now, when he stated what was the intercourse actually existing, under these circumstances, it must be admitted that the effect exercised upon it by the packets was very insignificant. The intercourse previously existing, too, it must be borne in mind, was carried on by means of a rude vehicle called an Irish car, and in this manner they were carried at prices varying from 5*d.* to 7*d.*, the proximate number being about 800 daily. The railway had been opened about two years, and the intercourse was in the ratio of a quarter of a million of persons annually. Now that furnished another example of the numerical proportion previously referred to: for if they took the number of passengers before the opening of the railway at 800 daily, it would be found that the proportion of four to one would give 3,200, and 3,300 was the average of the present number—the travelling on the Sunday being 7,000, the proportion the other days less; but the average above given being fully made up. He had thus shown that the law of increase was fourfold; he would now show that it depended infinitely more on the saving of time than money. On the Liverpool and Manchester railway the price was less than one-half the charge by the coaches; but on the Dublin and Kingstown railway the charge of conveyance was absolutely raised, and, besides that, the railway did not reach the latter place by half a mile, which occasioned to many an additional charge for carriage-hire to take them over the remaining ground. On that railway there were three classes of trains, and the fares were 1*s.*, 8*d.*, and 6*d.*; the carriages most filled being those at 8*d.*; it was quite fair, therefore, to assume that, in this instance, three out of every four travelling on the railway did so merely on the score of the saving of time. It would be well if they could go back and see what were the effects produced on intercourse by the establishment of turnpike-roads and the introduction of coaches; they would find probably that the great increase had been wholly owing to the time saved by the improvements effected. It was remarkable, however, how much results varied, for he had ascertained that, though much improvement had of late years been effected in the mode of travelling by canals—in certain cases the boats having attained to a speed of 10 miles per hour, equal to that of the coaches, while they carried their passengers at a far cheaper rate—yet he did not find that they added much to the intercourse. He alluded more particularly to the boats on the Kendal and Preston and the Edinburgh and Glasgow canals; and, he asked, could it be doubted, if railways were running parallel with them, that an increased traffic would immediately take place? He mentioned this merely to show how much more economy of time was regarded than the mere saving of money. Dr. Lardner then proceeded to remark on the value to new companies of the experience gained in working the Liverpool and Manchester railway. The charge for transport of passengers on the Manchester railway was 1.84-100ths of a penny per mile, the actual cost to the proprietors about 1*d.* per mile: whereas a Birmingham manufacturer had entered into a contract, by which the whole of the passengers on that line would be conveyed at the cost of one farthing a mile, including every expense of locomotive power, the company merely finding the carriages and the road. The same company had also formed a contract for the conveying of goods at 1*d.* per ton per mile, the contractor, as in the former case, defraying every charge for engines, &c. Dr. Lardner then proceeded to show the possibility of attaining so high a rate of speed as 50 miles per hour, and dwelt at great length on the effects likely to result to the general commerce of the country.

Lord Sandon doubted whether we were yet in such a position as to be able to deduce a statistical law of increase for railways. He could not receive it as established, that the increase would be always fourfold; for intercourse obviously depended on the character and class of the population at each terminus of the railway. Neither did he think that Dr. Lardner had established his point, that cheapness was no element in the law of increase. The Doctor had spoken with great uncertainty of the Kendal and Preston canal, though this was one of the facts most material to his argument. It appeared to him that the Doctor's data were few, and liable to great variation, and, consequently, that they would not establish a given and constant ratio. All that could now be done was to collect facts.—Baron Dupin said he doubted whether the great rate of speed contemplated by Dr. Lardner was either attainable or desirable. To proceed at the average rate of 50 miles an hour on a level might be practicable; but gentlemen should remember that there were gradients in the road, that the carriages must ascend these with diminished velocities, and that, to compensate for this loss, they must go at the hurricane rate of 80 or 100 miles per hour. Nature had set limits to the durability of materials; he doubted if metals could bear such excessive action. On the Doctor's own showing, such excessive speed was only attainable at extravagant cost. Saving of time was only worth just as much as the time itself would bring. If a man earned but five shillings a day, he would do wrong to give six shillings for saving that day upon the road. He believed it would be more prudent for the proprietors, and far more useful to the public, if, in all railway speculations, more attention was paid to lessening the fares, than to the search after miraculous velocities.

Mr. John Taylor, Treasurer to the Association, read a paper on the Comparative Value of the Mineral Productions of Great Britain and the rest of Europe. A calculation, he said, was made by Mr. C. F. Smidt, in 1829, of the value of the mineral productions of Europe, at continental prices; and, from the accuracy of the statements coming within Mr. Taylor's own knowledge, he was disposed to believe in the others. It should be borne in mind that the continental prices differed greatly from those in England, and, consequently, that the amounts were comparative, and not absolute value. The value of the mineral products of Europe, including Asiatic Russia, were,—gold and silver, 1,943,000; other metals, 28,515,000; salts, 7,640,000; combustibles, 18,050,000; making in round numbers a total of about 56 millions exclusive of manganese. Now to this amount Great Britain contributed considerably more than one half—viz. 29 millions, in the following proportions:—silver, 28,500; copper, 1,369,000; lead, 769,000; iron, 11,292,000; tin, 536,000; salts, 756,250; vitriol, 33,000; alum, 33,000; coal, 13,900,000. He then gave a sketch of the history of mining in Great Britain, dwelling strongly on its vast increase since the introduction of the steam-engine.

Dr. Yellowley read a paper, containing some account of the employment of Spade Husbandry on an extensive scale in the county of Norfolk. The paper contained a very minute account of all the items of expenditure and return. But the experiment, though to a certain extent successful, appears to have been made under such special circumstances, that it would not warrant the deduction of any general inference.

Section G.—MECHANICAL SCIENCE.

[As we have yet to fill out the skeleton of the proceedings on Tuesday in this Section, and as we are still pressed for room, we think it best to defer the Report altogether until next week.]

EVENING MEETING AT THE THEATRE.

Rev. W. D. Conybeare, V.P., took the chair, in the absence of the Marquis of Northampton. The Secretaries having read abridged reports of the proceedings of the Sections, Prof. Whewell stated that one paper, a letter from Sir John Herschel to Sir William Hamilton, appeared to the Sectional Committee so highly interesting and important, that they had reserved it for this meeting.

Sir William Hamilton, after pronouncing a merited eulogy on Sir J. Herschel, then read the following letter:—

"Feldhausen, Cape of Good Hope,
"June 13th, 1836.

"By your last, which only reached me yesterday, (though dated on the 16th of March,) I learn that the meeting of the British Association will take place early in August. Had it been in September, it might have been practicable for me to have drawn up (not without difficulty) somewhat of a detailed report of my proceedings here. As it is, however, nothing short of a miracle could enable me to do so in time for your meeting. The fact is, since our arrival here, I have been so entirely occupied with the mechanical processes of observation, and the actual *cutting* and *carrying* of my harvest, that I have not had any time to thresh it out for consumption; or, to drop figure, I have got a monstrous collection of rough observations, but hardly a figure reduced. So much as this however I may say, that I have swept over all, or nearly all, that part of the heavens, which is invisible, or hardly visible, in England, except just in the immediate vicinity of the pole (a most barren region), and (favoured by a season of almost uninterrupted clear sky, and a definition and tranquillity of the stars under great apertures and magnifying powers which I want language to express,) have amassed a large collection of nebulæ and double stars of all classes, orders, and degrees. Of some of the most remarkable objects which have occurred to me I have sent a brief list to Schumacher, who may probably have inserted them in his Astronomical Journal; I can here only find time or room for a few general remarks.

"The general aspect of the southern circumpolar region, including in that expression 60° or 70° of S. P. D., is in a high degree rich and magnificent, owing to the superior brilliancy and larger developement of the Milky Way; which, from the constellation of Orion to that of Antinous, is in a blaze of light, strangely interrupted, however, with vacant and almost starless patches, especially in Scorpio, near α Centauri and the cross; while to the North it fades away pale and dim, and is in comparison hardly traceable. I think it is impossible to view this splendid zone, with the astonishingly rich and evenly-distributed fringe of stars of the third and fourth magnitudes, which form a broad skirt to its southern border, like a vast curtain,—without an impression, amounting to a conviction, that the Milky Way is not a mere stratum, but an annulus; or, at least, that our system is placed within one of the poorer and almost vacant parts of its general mass, and that eccentrically, so as to be much nearer to the parts about the cross, than to that diametrically opposed to it.

"The two Magellanic clouds, Nubecula Major and Minor, are very extraordinary objects. The greater is a congeries of stars, clusters of irregular form, globular clusters and nebulæ, of various magnitudes and degrees of condensation, among which is interspersed a large portion of irresolvable nebulæ, which may be, and probably is, *star dust*, but which the powers of the twenty feet telescope show only as a general illumination of the field of view, forming a bright ground on which the other objects are scattered. Some of the objects in it are of very singular and incomprehensible forms; the chief one especially (30 Doradûs), which consists of a number of loops, united in a kind of unclear centre or knot, like a bunch of ribbons disposed in what is called a true-lover's knot. There is no part of the heavens where so many nebulæ and clusters are crowded into so small a space as this 'cloud.' 'The Nubecula Junior' is a much less striking object. It abounds more in irresolvable nebulous light, but the nebulæ and clusters in it are fewer and fainter, though immediately joining to it is one of the richest and most magnificent globular clusters in the hemisphere (47 Toucani). It is somewhat singular that this nubecula is placed a full hour too late in Right Ascension in all maps and catalogues, probably owing to a misprint or other similar cause of error, in the authorities employed to construct them.

"The great nebulæ in Orion and η Argi are, however, by far the most surprising objects this hemisphere presents. The former appears to much greater advantage than in our latitudes, and presents many appendages, branches, and convolutions, which are not discernible in its low situation in Europe. The latter is an object *sui generis*, and which, without a figure, it would be useless to attempt a description of. I should mention that I have spared, and shall continue to spare, no pains to procure correct drawings of these and other the southern nebulæ. I cannot trace in η Argi, as seen in the twenty feet, any resemblance to the figures published of it; though in the seven feet equatorial (furnished with a five inch achromatic object-glass) some leading features of those figures may be recognized. It is of immense extent, and crowded with stars, to which the nebulæ form a brilliant back-ground.

"The planetary nebulæ of the southern circumpolar sky are numerous (for the class of objects) and highly characteristic. I have discovered no less than five, quite as sharply terminated in their discs as planets, and of uniform light. Indeed, the first on which I fell was so perfectly planetary in its appearance, that it was not until several observations of it at the Royal Observatory, by Mr. Maclean, had annihilated all supposition of its motion, that I could relinquish the exciting idea that I had really found a new member of our own system, revolving in an orbit more inclined than Pallas.

"You may form some idea of this climate, as regards clearness of sky, from what was told me by our provisional governor, Colonel Bell,—viz. that out of forty-two successive days, he had only three times been disappointed in finding Venus, with the naked eye, in broad sunshine (at 9 A.M.). I read with ease, a few nights ago, the most involved parts of a lady's closely crossed letter by the light of *an eclipsed moon*, then near the zenith—(certainly the eclipse was not a great one).

"The finest double stars (not hitherto described) which I have as yet detected, are γ Lupi, π Lupi, γ Centauri, β Hydræ, and ε Chamæleontis. The three first mentioned are of extreme closeness, ranking in that respect with the closest stars in the northern hemisphere. The admirable tranquillity of the air for several months past, so different from the chaotic state of things all previous accounts had led me to expect, has given fair play to my reflectors; and by diminishing the discs of stars under high powers, nearly

to points, has enabled me in almost every case either to detect the duplicity of stars examined, or (what is not less difficult) to prove a decisive negative. In the polishing of my mirrors I have been particularly successful; in fact, they gave me no trouble whatever; and having three of the great specula to replace one another, on the slightest dimness appearing on any one of them, I have no hesitation in consigning it at once to the polisher, whence, after losing about 1-200,000th of an inch of its surface, it comes forth like a snake that has thrown its skin, brilliant and ready for a fresh attack. No prior experience had led me to anticipate anything half so favourable: I have not met with a single failure. I have looked well out by Runcker's Ephemeris for Halley's comet, with fresh-polished mirrors, but without success."

The remainder of the letter contained some remarks on the recent discoveries in optical science, made by the distinguished astronomer to whom it was addressed.

The discussion on Dr. Daubeny's paper on Thermal Springs* was renewed, more with the design of giving the ladies an opportunity of seeing and hearing some of the leading men, than of adding to the information already elicited in the Chemical Section. The speakers were Professors Daubeny, Phillips, Sedgwick, Taylor, Whewell, and Babbage. The points discussed have already been noticed in our Report.

THURSDAY, AUG. 25.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

The president called on Mr. Peacock, who, he said, would read a communication from Mr. Talbot, 'On the Integral Calculus.' This communication began by stating some remarkable cases of rectification of certain portions of ellipses, and other conic sections, which had been accomplished by Feguani. This topic thus started, had been followed up by Euler, Legendre, and some others, with their wonted skill and success. The principle of these rectifications depended on the fact, that differential functions, which were not integrable alone, frequently became so when associated into one sum with other differential functions. Euler, Legendre, and the others, in pursuing this subject, had confined themselves; had they extended their examination with a view to finding the conditions under which three or more differential functions of a particular class became integrable, it is probable they would have made the discoveries now claimed by Mr. Talbot. This gentleman showed, that when the abscissæ of a [any?] curve had the relation expressed by the equation $x^3 - \frac{r^2 x}{4} - r = o$, the sum of the arcs became integrable; r being an arbitrary constant, and, therefore, affording an immense number of particular cases, in which this rectification could be obtained—viz. all in which the value assigned to r would not render any of the roots of the equation imaginary. The same principle was also found to be applicable to cases where the roots were more numerous. The inverse problem, however, was much more difficult, so that Mr. Talbot has succeeded in assigning an algebraic value to the sum of three or more integrals of functions, whose denominations are not merely quadratic radicals of entire functions of the fifth and higher degrees, such as constitute the ultra elliptic integrals, furnished by Abel's celebrated theorem; but also of others whose denomination are cubic, and other radicals of similar functions, which that theorem does not contemplate; —thus effecting a very great extension of one of the most difficult and interesting departments of the integral calculus.

Dr. Apjohn then made a communication 'On the use of the Wet-bulb Thermometer, in determining the specific Heat of Air.' He commenced by stating some slight corrections of former statements of his, which became necessary, in consequence of his having erroneously stated the result of his experiments, in a communication which he had laid before the Chemical Section, at the Dublin Meeting of the British Association. The conclusion really deducible from his experiments at that time, was a confirmation of the opinion of Haycroft, Marcet, and De la Rive, that all gases have under *equal volumes* the same specific heats. In consequence, however, of the hurry in which he had made his calculations, on the day preceding the first meeting of the Association, he had calculated from a formula which applied to atmospheric air, and which was only a case of the general formula from which he should have calculated, into which the specific gravity of each gas should have entered; but the specific gravity of common air being unity, the formula he used caused him improperly to omit dividing by the specific gravity of the gas, and thus he appeared to have come to the conclusion, that "the gases had all the same specific heats under *equal weights*." He had since, however, employed an apparatus capable of affording extremely accurate experimental results, and had carefully reduced these observations; and the conclusion to which he had now deliberately come, was, that the commonly received law of equal specific heats under equal volumes, is erroneous; that this law is not, as supposed by Dulong, true for the simple gases; that no simple relation can be discovered between the specific heats, specific gravities, or atomic weights of bodies; but that his numbers for the specific heats come nearer to those of De la Roche and Berard, than to those of any other inquirer.

He then briefly explained his own formula for the use of the wet-bulb thermometer, and showed how, when other gases than common air were used, a factor involving the specific heat must be used; and hence conversely, these formulæ could be used for determining the specific heats, as soon as the numerical values of the other quantities which they involved had been ascertained by experiments. The principal difficulty was to free each gas from a small portion of common air, which, after the utmost care in their preparation, was still found to contaminate them: this he got over, we understood him to say, by investigating a formula for mixed gases, then finding the specific heats of the pure atmospheric air, and of a mixture of the gas to be tried and air; from chemical analysis deducing the proportion of parts in the mixtures, and thence deducing the specific heat of each gas by itself.

The apparatus which he used in these experiments consisted of two copper gasometers with glass bells, connected with each other by one string passing over pulleys, in such a manner that as one bell was pushed down the other rose an equal quantity; these bells were furnished with barometric tubes, to note the amount of pressure to which the gases within were subjected, and thermometers, both plain and with moistened bulbs for the temperatures; the copper vessels were connected at their under parts by a tube, so as to permit a free communication of the confining fluid in one vessel with that in the other; this confining fluid was strong sulphuric acid. By the aid of this apparatus, he found the specific heat of common air to be 2.705, compared with that of water, unity. He then proceeded to try other gases, and found that carbonic oxide alone came nearly under the law of Marcet. He found the law, "specific heats, under equal weights, reciprocally as the specific gravities," to be entirely erroneous. The specific heat of hydrogen gas, he found to be 1.47, that of common air being taken as unity.

Professor Sir W. R. Hamilton, then made a communication 'On the Calculus of Principal Relations.' Sir William stated, that it would probably be in the recollection of some Members of this Section, that at a previous meeting of the Association, at Oxford, he had laid before that body a general method of mathematical investigation, connected with systems of rays, which he conceived would be of some use in optical researches, and had found it of considerable use to himself. At Edinburgh, he had given a general dynamical principal, by which he reduced all mechanical questions, however numerous the bodies concerned, or however complicated the conditions of any problem might be, to the integration of one general formula; which, when it became integrable, by either approximation or rigorously, the problem itself would then be solved; and he had instanced this in the relations of the numerous bodies which compose the solar system. The method of principal relations, a slight sketch of which he now proposed giving, was still more general than either of these. By it, he proposed to reduce all questions in analysis to one fundamental equation or formula, no matter how numerous the conditions, or the number of the independent variables might be. This method even begins by giving the results of the integration of the partial differential equations to which the calculus of variations conducts us, as its final effort. The principle of the method depended upon the fact, that he had discovered the following relation, which he termed Principal, to subsist between all differential functions, no matter how numerous, or independent the variables—viz. $\frac{\delta ds}{\delta dx} = \frac{\delta s}{\delta x}$. He explained this formula for the principal relation, and proceeded to show its correctness and application, by an example derived from the question—what is the shortest possible distance, upon a given surface, suppose a plane, between two given points?

The Rev. Mr. Scoresby gave an account of two very delicate magnetic instruments. The first of these, he called a magnetimeter, from its extreme delicacy in detecting and measuring extremely minute magnetic influences. The principle of this instrument was, that the bar or other body in which the minute magnetic influence was to be sought for, was placed on a brass stand, which was capable of being raised or lowered, upon a joint, in such a manner as to place it exactly in the place of the terrestrial magnetic equator, in which position the magnetism of the earth exercised no disturbing or inductive effect upon the magnetism of the body under trial. The test was the deviation, caused upon a very small but delicate needle, placed upon the brass stand, upon which the brass joint before described turns. So very delicate is this instrument, that by it, Mr. Scoresby showed, that the magnetism produced in a very soft piece of iron, by swiftly drawing it once or twice through his fingers, instantly deflected the needle, and this became sensible. He also stated, that so delicate was the instrument, that the inductive influence of the small needle upon the bar of soft iron, became quite perceptible, so as to require the equatorial plane to be set at an angle inclined two or three degrees to the magnetic equator, before the position of no influence of the earth and little magnet conjointly, could be obtained. This instrument, he stated, was capable of many useful practical applications; among others, by it can readily be determined the relative softness and goodness of different specimens of iron, for the softer and finer any mass of iron is, the more readily is its magnetism developed; but the more speedily it again loses all appearance of magnetic excitement.

The second instrument was a very powerful, and yet very light, magnet, mounted in such a manner as to be eminently fitted for observing accurately the variation of the needle, as well as its diurnal and annual changes. He stated, that he found a very fatal error prevalent upon the subject of magnets, namely, that the best temper to give to a needle was hard at each end and soft in the centre. So difficult was it to drive the workmen from this, that he had even found one of the needles, furnished him at the commencement of one of his voyages to the Arctic Regions, by the late Captain Kater, and made under the inspection of that great and accurate philosopher, to become useless after some time, in consequence of this very defect. So important did he (Mr. Scoresby) consider this matter, that he had chosen the material for constructing his magnet upon the principle of the extremely uniform temper given to it—this material was the steel busks used for ladies' boddices. Those most esteemed by the ladies were the more slender and elastic ones, whereas the thicker, and therefore less expensive busks, he found to be best. He preferred those which were about 1-20th of an inch, or 1-25th, and which were well and evenly tempered throughout. Six of these busks, on each side, were then put together by brass pins, in such a manner that they could with great ease be taken asunder when that was required; these bars were kept asunder in the centre by a light piece of wood, in which was placed the agate cup for the centre motion, and in other places thin card paper was interposed, to prevent their touching—this he considered a precaution of some consequence, as otherwise inequalities in the component magnets would materially weaken the compound of all the arrangement described. Upon each end of this magnet was mounted a silver vernier, corresponding to silver graduated arches in the box, placed at the distance of one-half the length of the magnet from the central pin on each side. To relieve the centre of much of the weight of this instrument, a brass gibbet was attached to the middle of the oblong box in which the magnet was placed, and from the centre of this an untwisted

* See Sect. B. (Wednesday.)

fibre of silk descended through the glass cover of the box to the centre of the magnet to which it was attached, and a tempering screw adjusted its length in such a way as to relieve the steel point of almost the entire weight of the magnet. So powerful was this magnet, that a key, held within three inches of it, became so powerfully magnetized by induction, that it supported at its end a ring, such as is used for connecting keys into a bunch. Mr. Scoresby said its delicacy could not be surpassed; and by it very minute changes of terrestrial magnetism could be detected, as, the diurnal change, effect of interposed rocks; and Professor Christie, who had seen some of its indications before he came from the adjoining room, had even stated his conviction of the probability, that by this the magnetic effect of the solar rays, and the change caused by the passing of a cloud, would become perceptible.

Dr. Ritchie stated, that he considered the instruments described by Mr. Scoresby as very valuable, but that he himself had used the steel busks of ladies for forming magnets, and had exhibited them at his lectures, as also the blades of steel made for saws, which he found to be even preferable. The opinion was a very common one, and, he believed, depended for its establishment on the very accurate experiments of Kater, instituted for the very purpose of ascertaining the best form, temper, &c. of magnetic needles—that the best temper was hard at each end, and soft in the centre. Dr. Ritchie then mentioned some precautions that would be required when using the first instrument, lest the induction of the small needle, and the induction of the earth, should interfere with the accuracy of the results.—Professor Christie explained, that he did not mean to convey to Mr. Scoresby the impression that he had tried any experiments upon the magnetic effects of the solar ray, or of clouds becoming interposed—what he had said was merely as a probable application of the instrument, on account of its extreme delicacy. The learned Professor thought that Lieutenant Le Compte (in his voyage from the island of St. Helena) was the first person who proposed detecting minute magnetic influences by getting rid of terrestrial induction, by placing the body in the plane of the magnetic equator; but he considered the instrument produced by Mr. Scoresby as a very neat and delicate one for applying this principle. The learned gentleman made some other observations.—Prof. Stevelly observed, that Captain Kater had distinctly stated that the best temper for magnetic needles was soft in the middle, and about two inches at each end hard. The experiments upon which he grounded this opinion are given in detail in the Encyclopædia Metropolitana; and the Professor stated, that he had reason to know that this error was, even now, misleading the manufacturers, as the name of Kater ranked, deservedly, so high; for his part, since he had the pleasure of hearing the remarks of Mr. Scoresby, he saw distinctly the source of the error, which, as might be expected, was to be accounted for without in the slightest degree compromising the high character of Captain Kater for acumen and experimental accuracy. The fact is, the softer iron or steel is, the more readily is it impregnated with the magnetic influence; but, on the other hand, the more readily and rapidly does it part with it. Now Kater's professed object was, to ascertain what temper enabled a needle to take the strongest directive power; and his experiments were made immediately, or very soon after the tempering process: he therefore only stated what he must have experienced, that the maximum directive power was taken by shear steel needles, soft in the middle and hard at each end. But the object of Mr. Scoresby being to take with him, and preserve for a length of time, these needles, it was no wonder that he found those made by Captain Kater to lose their power soon, and, in fact, from being very good, become very bad. As Mr. Scoresby stated that his very beautiful and sensible needle did not enable him to read the arcs of deviation from the mean place nearer than some minutes, as Mr. Stevelly understood him to say, he hoped he would not consider him presumptuous if he suggested to him, that measurements made by a Hadley's sextant could easily be made applicable to the reading off the deviation of a needle. Some of these methods he had published four or five years since in the Annals of Philosophy; and since the sextant was a very common instrument, and its actual angular divisions were really only the half of what they were numbered, it became capable of affording measurements in some instruments as close as five seconds of a degree. The method he preferred was, to cause the magnet to carry a mirror at each end, by means of a wire, which pointed to each mirror, and could be moved round outside the box in which the compass was, until the wire appeared to form a straight line with the reflected image, two points could be obtained, determining the position of the axis of the needle; and the angular deviation of this line from the astronomical meridian could then be easily measured by the sextant. Various other methods for making the sextant available in these measurements could be mentioned.—Mr. Peacock suggested to Professor Stevelly, that Gauss had used the mirror as stated by him, and that an instrument on this principle had been for some time at work at Greenwich.—Professor Stevelly was not aware of this.—Mr. Snow Harris suggested to Mr. Scoresby some practical improvements of his very beautiful instrument, by which the angles, by the method of multiplying, could be more nearly determined.

Professor Forbes 'On Terrestrial Magnetic Intensity at great Elevations from the Earth.'

The learned gentleman began by giving a rapid review of Saussure's observations connected with this subject. It was well known (he said), to men conversant with these researches, that this enterprising philosopher and naturalist ascended Mont Blanc, nearly at the summit of which he resided for many days, making and recording numerous meteorological experiments, at an elevation of about 11,000 feet above the level of the sea; but when his observations upon the magnetic needle were properly corrected, for the depression of temperature well known to exist at these great elevations, the result of them was, that at this great elevation there was no alteration of magnetic intensity which could be safely pronounced to be beyond the limits of the errors of observation. Subsequently, Gay-Lussac ascended in a balloon to the altitude of about, or perhaps beyond, 23,000 feet, yet his observations also, when due allowance was made for alteration of temperature, gave no alteration of the magnetic intensity. But the researches of M. Kuppfer, seeming to conduct to a quite opposite conclusion, and the result, as stated by him, being such as, if the observations were correctly made, would give a diminution of the magnetic intensity for stations whose elevation above the earth was considerable, which could by no means be accounted for by ordinary errors of observation. Professor Forbes deemed this a matter of so much importance to science, that he determined to make an extended series of observations at various levels among the Pyrennees and Swiss Alps. Accordingly, having last summer provided himself with a sufficient number of magnetic needles fit for making proper observations upon magnetic intensity, made at Paris, by the celebrated Causteen, and their times of vibration at Paris being accurately ascertained, he commenced his tour for this purpose in the neighbourhood of Barege and Baniers; and, from a multitude of observations which he had made and recorded, he now wished to select a series of forty-five observations, made at thirteen different stations, the elevation of which above the level of the sea varied from 6,000 to 10,000 feet. Before he detailed these observations and their results, he described the principle upon which they were conducted, and which appeared to us extremely ingenious, and well calculated to lead to the most satisfactory results. In each instance, the observations were made at three distinct stations—one on the summit of the mountain peak, or most elevated spot, and two at a lower, but equal, level, on each side of the hill, so chosen that a vertical plane would pass through the three stations, and be perpendicular to the axis or length of the hill. It is obvious, then, that, speaking generally, any disturbing effect exercised upon the needle by the materials of the hill at one of the lower stations, would be opposite in kind to that exercised at the other of the two lower stations; and, therefore, the mean between these observations, made at the two lower stations, would give the magnetic intensity at a point immediately beneath the upper station. By a comparison of this mean intensity, therefore, with the intensity at the upper station, it could be readily proved whether or not the intensity diminished as you ascended to a greater elevation. The result of the entire of this most laborious course of experiments was, that, with the exception of one solitary instance, the stations being in the Pyrennees, and in the neighbourhood of iron mines, there was no diminution of the magnetic intensity at the higher station, at least beyond the limits of the necessary errors of instruments and observations: even at the station where some diminution did manifest itself, the quantity of that diminution was very much indeed smaller than that which resulted from the views of M. Kuppfer.

Dr. Ritchie begged to inquire from Professor Forbes, whether or not he took the difference of dip of the needle of the two stations, in order to get the absolute intensity, and not merely the horizontal intensity.—Professor Forbes replied, that he did in general take the dip, but he did not rely much on observations connected with the dip in this particular question, for every one acquainted with experimenting on this subject was aware that the difference of dip might be very considerable, without affecting the relative, or even the absolute, intensity. If, however, any person should require, for other purposes, experiments upon the dip at these various altitudes, he was in a condition to furnish them with many.—Professor Hamilton briefly stated some reasons for believing that Professor Forbes's results were quite satisfactory, without any reference to the dip.—Dr. Ritchie still held that the observations were incomplete in relation to the absolute intensity at several stations, unless the dip were accurately attended to.—Professor Lloyd demonstrated, by a reference to a diagram, and to the formula for the intensity, that it was not necessary to take the dip into these experimental investigations. He fully agreed with Professor Forbes, that the dip might be very different, and yet the intensity the same at two stations.—Professor Stevelly warmly congratulated Mr. Forbes upon his success in these researches, and called upon the Section to consider the one point—namely, the amount of mechanical labour expended upon the moving his own person and all the instruments requisite in these researches up and down such immense mountain ranges. He stated his conviction that if this labour could be reduced to a numerical statement, so as to compare it with the work of a steam-engine, or the number of horses' power, it would create no little surprise. The use he wished to make of this remark was, to urge upon Professor Forbes, and other gentlemen engaged in meteorological researches, the advantage they would derive from the use of a balloon, which could be securely moored in the air at various altitudes, by at least three stout whipcords, unwinding from little windlasses, one of which should be placed on the summit of the nearest high hill, away from which the wind blew. He thought this to be a matter upon which the funds of the British Association might most legitimately be expended.

Professor Powell, 'Respecting the impermeability of water to radiant heat.' The Professor stated, that this subject had been investigated by Melloni, who discovered that rays of non-luminous heat were differently refrangible, as well as the luminous rays, and that the most refrangible calorific rays pass nearly undiminished through water; but the least refrangible are entirely stopped by that liquid. This subject becomes important from the great simplification that would result in many experimental inquiries, if radiant heat did not pass through water. In consequence, many accurate experiments on the subject were performed by Professor Forbes and by Dr. Hudson; (we did not exactly hear whether he said the results were satisfactory to his mind or not;) it occurred to him, that thermometers with coated or coloured bulbs, placed beneath the surface of water at various depths, would, by the time they took to cool, lead to some valuable results on the subject; his conclusion was, as far as we understood him, that non-luminous heat could not pass through water; (but there was some noise, and we did not distinctly hear the learned gentleman).

Dr. Ritchie stated, that he had many years since published experiments, which were conclusive on this subject. He allowed a thin sheet of water to escape from a slit in the side of a vessel kept full, and he found that non-luminous heat could not pass through

the thinnest stratum of water. Professor Powell explained, that this was not conclusive, as heat might pass through thicker masses, which could not pass through very thin fibres.—Professor Forbes gave a rapid account of Melloni's experiments on this subject; his result was, that of dark heat, not all, nor much, was allowed to pass, but some. In his experiments, he (Professor Forbes) came to the same conclusion. He stated, that in his opinion Professor Powell's mode of experimenting was subject to much chance of error, for although the conducting power of fluids was little or nothing, yet their carrying power was very great, and this was quite distinct from a power or capacity of transmitting radiant heat.

A paper by Sir David Brewster, 'On the action of crystallized substances upon Light,' was then read by the Secretary, Mr. Snow Harris.—In this paper, the author stated, that some experiments of his upon the action of certain crystallized substances, which he had published many years since, had not attracted the attention of mathematicians, until about three years since, when they were taken up by Mr. M'Cullagh, Fellow of Trinity College, Dublin, who showed that these facts were consequences of the undulatory theory. This, of course, stimulated him, and made him anxious to verify and extend these experiments: accordingly, he applied at the British Museum, for leave to take with him several peculiarly fit specimens of crystallized bodies—viz. of arragonite and quartz, which were deposited in that national collection; but he was most disagreeably disappointed and vexed to find, that there was an act of parliament against even the dust of a crystal leaving the premises. This he characterized as a most impolitic regulation—one much calculated to impede the progress of scientific research, and which it would be most becoming in the British Association to aid in endeavouring to have removed. It was true, when he had returned home he received an intimation that he would be permitted to try any experiment he might wish in the apartments of the British Museum; but this permission it was impossible for him to avail himself of. Accordingly, his only resource was, to have recourse to crystals, the surfaces of which were cut and polished by Mr. Nicholl, of Edinburgh. The results he arrived at were, that when light is at the separating surface of two media, the lowermost one of which is doubly refracting, the reflected ray is subjected to the action of two forces, one of which is the ordinary reflecting force, the other a force which emanates from the interior of the doubly refracting crystals. In the course of these investigations, having had occasion to use a mixture of oil of olives and oil of cloves, he arrived at the extraordinary result of a plane reflecting surface, which exercised no action whatever either on polarized or common light. Sir David concluded, by adding, that some of these results were inexplicable upon any theory of light whatever, although he had little doubt but that the undulatory theory would, at length, be found adequate to their explanation.

Professor M'Cullagh asked Sir David Brewster some questions respecting these extraordinary results, to which answers, which seemed to satisfy him, were given.—Sir William Hamilton briefly reviewed the theories of Fresnel, Cauchy and M'Cullagh, and said, that to the strength and fruitfulness of the theory of his friend, Professor M'Cullagh, he could give the most ample attestation.—Professor Forbes thought it a curious fact, that just at the time when Cauchy had given up his theory as untenable, Professor M'Cullagh should take it up, and, by very slight corrections, demonstrate, that from it could be inferred, with perfect precision, the most surprising results of the most surprising series of experimental researches.—Professor M'Cullagh pointed out where the error of Cauchy must have lain, if he had, indeed, abandoned his own theory for that of Fresnel. He inquired whether the extraordinary statement of Cauchy had attracted the attention of any of the members of the Section engaged in these pursuits, namely, that light could, under certain circumstances, when it emerged from a refracting surface of a dense medium, upon which it had been incident in nearly the angle of total reflexion, undergo an extraordinary increase of intensity. For his part, he did not see how this could possibly be proved in such dispersed light.—Professor Stevelly inquired whether the eye, unassisted by any instrument, was made the judge of this increase, or aided by some kind of photometer.—Professor M'Cullagh said, unassisted.—Professor Stevelly asked, in that case could it be a deception arising from some of it falling upon the irregularities of the surface along which it was almost moving, and being thus reflected, and thus causing a greater apparent brightness along its course?—An animated discussion here took place between Professor Lloyd, Sir W. Hamilton, Professor Forbes, and Mr. M'Cullagh, on many topics connected with the paper.

Dr. Williams then gave an account of an improved Ear Trumpet.

Dr. Williams had noted three causes of indistinctness in the common trumpet: 1. It renders distant slight sounds, giving rise to a roaring kind of noise. 2. The longitudinal vibrations of the columns of air within it. 3. Transverse vibrations. The two first it is almost impossible to remove; the third cause he attempted to remove, unsuccessfully, by perforating the sides of the trumpet with moderate-sized holes; but this was found greatly to impair its useful properties. On the whole, he found the three causes to be diminished as far as is perhaps practicable, by using a trumpet with a very large opening, being not unlike, in shape and size, the paper-cap of a loaf of sugar. For lightness, he stated that he had found that the lower part might be made of japanned tin plate, and the upper part of cardboard. When the entire was of japanned tin plate, a handle, something like that of a coffee-pot, might be placed on the side at which the right hand could conveniently hold it.—Professor Challis seemed to approve of this form of the ear trumpet.

The President then said, that as there were yet a great many interesting communications to be brought forward, the Section would re-assemble at eight o'clock in the evening.

Thursday Evening.—Mr. G. W. Hall made a communication upon 'The Connexion observed at Bristol between the Weather and the Tide.'

He commenced by stating, that long and carefully continued observation of the weather at Bristol, together with a direct interest in becoming possessed of rules for anticipating its changes, led to the following theory, which was strikingly correspondent with facts:—1st, That the barometer very generally, indeed, almost invariably, undulates at times corresponding with the changes of the Moon, and at these times it more frequently falls than rises. 2ndly, That the weather is ordinarily unsettled at these periods, continuing so for about two or three days; and for the most part the wind becomes high at these times. 3rdly, That as the weather settles, (if it become at all settled, since it not unfrequently remains in an unsettled state,) so will it continue until the next change of Moon, or rather until the recurrence of its disturbing influences. 4thly, That these variations occur as regularly at the quarters of the Moon, as at the new and full, and are then as fully marked. 5thly, That the period, about five days, which determines the state of the weather, is derived from the spring and neap tides, or the full influence of the Sun and Moon upon them.—The only origin of these rules, he stated, was actual observation. Very striking changes of temperature and weather from intense frost to spring mildness, and then frost recurring, first led to marking this correspondence; and so closely has it been observed, and so fully established, that operations upon a large scale, which are dependent upon the weather, have been frequently and successfully conducted in accordance with these rules. He considered the severe frost of 1813-14, which continued about twelve weeks, with partial thaws intervening, and the severe weather of succeeding winters, with their intermissions, to be closely connected with the above rules. The partial rains also of very dry summers have been found to take place at the same seasons of change, insomuch that for amusement he had frequently traced back the periods connected with the age of the Moon, from the thaws that took place in severe weather, or the rains occurring in long-continued drought. Residing on the banks of the river, and taking much interest in the operations of Professor Whewell, respecting the tides, and his description of these, Mr. Hall stated, that he had been led closely to compare them with the weather; but difficulties to him insurmountable had occurred, when considering the variations of weather in different places at the same time; yet, regarding those in the neighbourhood of Bristol, his conviction was unwavering. Perhaps, the varying time at which the tide reaches various places, so fully described by Professor Whewell, in his lecture on Tuesday evening, might assist in solving this difficulty; and if the attention of others were directed towards it, his end would be attained.

Mr. Rootsey stated, that his observations fully confirmed the remarks of Mr. Hall: in variable weather, the crisis of the day was always to be looked for at the change of the tide. The tide-wave, when of the enormous magnitude with which it reached Bristol, (fifty feet,) must alternately lift up and let down the atmospheric column which stood upon it, and thus give rise to changes in the barometric state of that column, which every person knew caused the other changes, or at least preceded them.—Professor Forbes had no doubt in his own mind, that the crisis of the day in the neighbourhood of Bristol was to be looked for near the times of the changing of the tides, but the lunar tides he thought were too small materially to affect the barometer.—Professor Stevelly stated, that he fully agreed with Professor Forbes in the remarks he had made; but if he understood Mr. Rootsey aright, the influence of the Moon upon the atmospheric column, to which he referred, was not that direct one exercised in causing an atmospheric tide, but the indirect one of first causing a tide in the watery ocean, which in its turn lifted up and let down the atmospheric column, so as to cause condensations and rarefactions, very much removed from its mean state. Rarefactions and condensations we well know have much influence on many meteorological phenomena, and, therefore, he thought this a valuable hint; the great rapidity with which the tide wave was propagated, and the direction in which it moved, would thus become a subject of interest to the meteorologist, when comparing changes of weather at distant places. That the Moon and Sun had an influence on the weather, was so well known, that rules for anticipating the consequent changes had been given to the public, by some person in the name of the elder Herschel; and 'Adcock's Engineers' Pocket Companion,' which he had then in his pocket, headed each month with prognostications of the weather, which were often, indeed, wrong, but he oftener found them right.—Mr. Harris stated, that of the influence of the Moon upon the weather he had no doubt, though rules for judging of its influence were still wanting. As to the rules attributed to Herschel, his friends warmly denied his having had any connexion with them.

Mr. Ettricke then gave a description of 'An Instrument intended to observe Minute Changes of Terrestrial Magnetism,' and of other philosophical instruments.

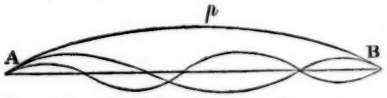
This instrument was somewhat similar to Coulomb's balance of torsion. Within a glass case, a magnetic bar was suspended by a silk thread or a long and slender wire; to this bar a circle was attached, graduated on its upper surface. A small telescope with cross wires in its focus, was then placed over the circle, and perpendicular to its plane, in such a way as to enable the observer to read off the arc of deviation caused by any change of magnetic influence. He then described the method of finding the magnetic meridian by the instrument. He then described some improvements in the rubbers of cylindric electrical machines, when the cylinder was a bad one; this consisted of a double framed rubber, the part next the cylinder being connected with the part next its glass stand, in such a manner as that either end could yield backwards, while stout guide-wires and a spring kept them pressed against the cylinder. The rubber itself consisted of a number of small square pieces of mahogany pressed forward each by a stout spiral spring. [We have seen and worked with a rubber made with these latter moveable pieces, but we must own we think the shortest and best way, when such a rubber as the one now described is required, would be to get a new cylinder.] New flannel he found the best material for a rubber. He then described some improvements in the mounting of a plate machine, the most impor-

tant, if we understood him, was to insulate the entire machine by glass legs. He stated that thin silk was bad for a machine. He then described a machine by which he could try electrical experiments in air rarefied or condensed to any required degree.

Some observations were made on this communication, by Mr. Snow Harris, Professor Forbes, Mr. Addams, and Professor Stevelly.

Mr. R. Addams then made a communication respecting the Vibration of Bells. He proposed the explanation of a peculiar undulating sound of certain tower and turret bells, and also of glass vessels with circular mouths. The phenomenon partakes of the *audible* character of a *beat*. He first described the cause of the varying intensity of a tower bell when swinging in the ordinary way; then he proposed the solution of the effect when the bell was stationary, and struck by a clock hammer. By experiments very ingeniously contrived, he showed that the acoustic nodes of the bell shifted their position, and either circulated round the whole circumference, or oscillated through a more limited arc on either side of the theoretical node, as calculated from the usual data, namely, the point of action of the force applied, and the quadrantal division of the circumference. Mr. Addams thinks this effect is owing to the unequal thickness, inertia, and elasticity of the bell. An interesting conversation then took place, in which Professor Stevelly, Professor Forbes, Mr. Addams, and others, took part.

Professor Forbes stated, that the phenomena could, as it appeared to him, be explained on the common principles of acoustics, without having any recourse to the supposition of an original defect in the bell; and, in truth, it was to be heard when the sweetest and best formed bells were sounded. It was well known, that sounding elastic cords, could assume, and did assume, during their vibrations, several curvilinear forms in succession, while the preceding curved forms again recurred. Thus suppose the line A B to be the elastic cord, it would in succession



assume the secondary forms, something like the curved lines that cross, while the principal vibration denoted by A *p* B, was going on. Now these secondary forms combined with the principal vibration, so as to add to its effect when they conspired at any one point, but to diminish its effect when their vibrations were taking place in an opposite direction, and consequently, the point of maximum effect of the sounding cord shifted its place backwards and forwards, not irregularly, but constantly, and in a manner hard if not useless to reduce to rule. Now a bell was like a musical cord strained round into a circle, and consequently its point of maximum effect, after it had sounded for some time, moved similarly round to several positions, and thus the ear of a person standing in a fixed place, was affected with an alternately swelling and subsiding series of pulsations, giving an origin to the phenomena described.—Mr. Addams expressed his conviction of the correctness of this explanation.—Professor Forbes wished to add that a defective bell, or one thicker at one part than at another, would unquestionably cause a beat or swell, on the principle described by Mr. Addams.

Mr. Rootsey then read papers 'On the Music of the Greeks, and a System of Mnemonic Logarithms.'

The first related to some kinds of musical chords used by the ancient Greeks, which by many were rejected as being impracticable, but which the author thought might be used in music with considerable effect.—The second related to a method of calculating by the aid of a system of logarithms, so simple, that the memory could easily retain the logarithms necessary for the most important concerns of life. This system he had long used, and with the most decided advantage. The logarithms belonging to it were had by dividing the common logarithms, each by a certain large number. This large number is 493; and for some purposes he uses the factors of this number, 17 and 29. Thus, since 17 is the 43rd part of 731, which is about double the number of days in a year, this number becomes useful in calculating interest.—$\frac{2}{20}$ is the fraction related to the legal interest, 5 per cent., in such a manner as to be constantly occurring. He then offered proof of the utility of his system, by examples taken from the ordinary work of the counting-house, and by financial computation.

Section B.—Chemistry and Mineralogy.

After the chair was taken, Dr. Daubeny stated that he was about to undertake some experiments with the view of determining whether carbonate of magnesia was or was not volatile, a point which he conceived important in reference to certain questions of much geological interest, started by Von Buch, and that he would report the results upon some future occasion.

Dr. Dalton then proceeded to give an exposition of his views upon the subject of Chemical Notation, and the atomic constitution of chemical substances. He began by the inculcation of a rule published by him nearly thirty years ago, for the purpose of ascertaining whether a compound be binary or not, and applied it to the compounds of oxygen and hydrogen; the result being, that when elements combine in different proportions, *that* of the series which it is most difficult to decompose must be considered as having the binary composition. Applying also this rule to the compounds of oxygen and carbon, and building upon the fact demonstrated by his friend and townsman Dr. Henry, namely, that carbonic acid may, and that carbonic oxide cannot, be decomposed by the electric spark, he drew the conclusion that the latter is composed of an atom carbon combined with an atom oxygen, while the former includes, associated with the same quantity of carbon, two atoms of oxygen gas.

The next compound to which he alluded was the acetic acid, and in reference to this substance he announced a very novel opinion, namely, that instead of being, as is generally supposed, compounded of 4 atoms carbon + 3 oxygen + 3 hydrogen, it is in reality made up of three elements united in the ratio of single atoms, and that the ordinary opinion of chemists in reference to it, is the result of the acetates being, though with difficulty, deprived by heat of a single atom of water. As an argument in favour of his more simple view of its composition, Dr. Dalton drew attention to the fact of its resisting very elevated temperatures,—such, for example, as are employed during the destructive distillation of wood.

The compounds of nitrogen and oxygen were then briefly glanced at, and while discussing their composition, Dr. Dalton advanced a new *canon* to guide us in selecting the binary compound. The choice is obviously between the nitrous and the nitric oxydes; and Dr. Dalton pitches on the latter as the binary, on the ground of its possessing the lower specific gravity.

Other compounds were also adverted to, in particular, ammonia, prussic acid, and sub-carburetted hydrogen. In reference to the two first, Dr. Dalton does not seem to have fully made up his mind; and a rather puzzling question was proposed to him by Professor Hare, namely, how, upon his principles, he can explain the non-existence of more simple compounds of nitrogen and hydrogen,—a question, the force of which cannot be understood, unless it be stated that Dr. Dalton denies the existence of very complex combinations, and contends that the tendency of atoms is invariably to form the simplest imaginable groups. In alluding to the light carburetted hydrogen, and which he, with other chemists, considers as a bihydroguret of carbon, Dr. Dalton enters into a very ingenious solution of an apparent difficulty,—namely, why, if it proceeds from the decomposition of water, it is not accompanied, as it escapes from stagnant pools, with the equivalent quantity of carbonic acid,—a difficulty which he completely removes by suggesting the extent to which the latter gas is condensed by water. Throughout the course of these observations, Dr. Dalton impressed upon the Section the superiority of his symbolic method over that which originated with Berzelius, and which would appear to be so popular at present.

Dr. Cumming inquired whether the atoms were considered to be of equal magnitude, inasmuch as they were so represented, and stated as an objection to Dr. Dalton's pictorial representations of them, that they were all shown as having their centres in the same plane, whereas, in point of fact, this cannot be the case in nature; and Dr. Dalton admitted the difficulty, stating, however, that it might be overcome by employing *models* instead of drawings. There was no discussion on the subject of symbols, and indeed this cannot be considered as matter of regret, inasmuch as the subject is undoubtedly exhausted. Dr. Daubeny, in his opening address, on Monday evening, gave a succinct, but, at the same time, satisfactory view of the respective advantages and defects of the Daltonian symbols, the algebraical, and the Berzelian notation.

Professor Johnston brought under consideration of the Section, the Chemical Tables which, at the instance of the Association, he has been so long occupied in preparing, and the idea of which was first suggested by Mr. Babbage in his essay upon the constants of nature and of art. We have no hesitation in asserting that Professor Johnston has ably fulfilled the task imposed upon him, and that the tables will be found extremely valuable, both as repertories of chemical facts, and indicators of those topics in reference to which our knowledge is imperfect, and which are deserving of further investigation on the part of chemical philosophers. These tables having been already circulated amongst the members of the Association, we shall confine ourselves to the statement that they comprehend what relates to the simple non-metallic elements, and such of their compounds as consist of but two dissimilar atoms; and that it was resolved at the Chemical Committee that they should be circulated among the members for *consideration* and *correction*, and that Professor Johnston should be invited to extend his labours to the metals, and the more important compounds into which they enter as elementary parts.

The next communication brought under the notice of the Section, was a short, but interesting paper, by Mr. Herapath, 'On the Production of Lithic Acid by the Silk-worm, and other varieties of insects.' In all these Mr. Herapath views it as a *secretion*, whereas in other beings it would appear to discharge no ulterior duty, and is therefore classed with the excretions of the animal body.

The leading paper of the day was contributed by Dr. Thomson, of Glasgow, and related to the phenomena which present themselves upon diluting oil of vitriol with different proportions of water. Dr. Thomson commenced by stating the precautions which he took in order to obtain oil of vitriol of perfect purity, and at the point of maximum strength, and which consisted in distilling and concentrating a specimen of Saxon acid, which had lain in his laboratory for several years, and become diluted by absorbing hygrometrical moisture. Separate portions of this concentrated acid were then taken, and mixed with water in different proportions, an atom acid with 1, 2, 3, 4, 5, and up to 9 atoms of water, and the temperatures evolved being measured, after the mixtures had cooled, their specific gravities were taken, and these were also deduced by calculation, on the hypothesis of there being no condensation, or, as it is sometimes called, penetration of dimensions. Upon comparing these results, it was found that in the case of the three first mixtures, namely, those in which an atom of oil of vitriol is mixed with 1, 2, and 3 atoms of water, there was a decided penetration, or the calculated specific gravities were less than the true; but that in the case of all the rest, the very opposite was observable, that is, there was an expansion, the calculated specific gravities being greater than the true. In the case of the three first also, the rise of temperature was most considerable, being greatest when an atom of acid was diluted with three of water. Dr. Thomson then proceeded to determine the specific heats of those different mixtures, according to the method of Mayer, or by noting the times that the same bulk of each took to cool through the same number of degrees, and dividing the numbers thus got by the specific gravities. The results at which he arrived are interesting in a high degree, being, that the mixture which produced the highest temperature had also the greatest specific heat. This conclusion, we say, is highly important, as furnishing a refutation of a very prevalent hypothesis, namely, that the heat evolved upon mixing oil of vitriol and water is due

to the circumstance of the specific heat of the mixture being less than the mean of the fluids mixed. Dr. Thomson then adverted to the law of Dulong and Petit, and he declared himself as convinced of the truth of the doctrine which represents the product of the specific heats and atomic weights of simple substances as a constant quantity, and also stated his conviction that the constant was the decimal .375, or three times the atom of hydrogen on his scale. But the most remarkable part of the paper remains to be mentioned. Dr. Thomson, if we understood him rightly, announced it as a general law, that the product of the specific heat of a compound substance, and its atomic weight, is equal, not to the constant of which we have just made mention, but to that constant, multiplied by the atomic weight of the compound. It is of course proper to proceed with caution in the adoption of such generalizations, and to be on our guard lest, through the love of simplicity, we be led into the adoption of error. Upon this law we shall deliver no opinion, but shall merely content ourselves with stating that it undoubtedly seems in almost perfect accordance with the results of Dr. Thomson's experiments upon mixtures of oil of vitriol and water; and that it enabled him to give what he conceived to be the true theory of the observed evolution of caloric.

Mr. Jones detailed the results of his Analysis of Wheat, which makes the starch, much less than it is usually considered, a modification of gluten soluble in alcohol and water, and a method of converting starch into the sugar of grapes, differing from that of Kirchoffer in the circumstance of concentrated, and not diluted, sulphuric acid, being employed in conjunction with a very small quantity of water, and without the application of any heat. He also announced that he had formed a peculiar fluid by the action of oil of vitriol upon wheat, and that azote, as is, we believe, universally admitted, is an element of the seeds of the Cerealia.

Section C.—Geology and Geography.

A paper was read by the Marquis Spineto on the geographical position of Memphis, in Egypt. The state of that city during the time of its long prosperity was first considered; then the causes of its destruction; and lastly, the opinions of different travellers regarding its position. Its particular site had been described by ancient historians as on an island in the Nile, evidently formed of the mud of that river; and that it had been protected from inundations by various extensive works erected by its kings. When its splendour decayed, these works went out of repair, and hastened the ruin of the city, which strewed with its fragments the place on which it had stood. Finally it was submerged under drifted sand, and its true position became a problem to modern travellers. Of late, however, the site had been determined by the French, who, in one of their exploring expeditions, had examined the stratification of the place supposed to be Memphis, and they ascertained the spot by the succession of drifted sand, ruins, and mud. Its latitude they fixed at 29° 20′ N. and longitude at 31° 30′ E. from Greenwich.

Mr. Murchison spoke of the great value of geographical papers to the geologist, and of the one just read, as an excellent example of this kind. He regretted the absence of Mr. Lyell, who was peculiarly qualified to discuss the question of the action of existing causes in operating upon the terrestrial surface; but he insisted on the necessity of keeping records of physical changes, as enabling our successors to avoid mistakes. He instanced the lias at the mouth of the Gloucester canal, as being now completely covered with mud, in consequence of a work erected by Lord Segrave not long ago. This lias had afforded a number of beautiful fossils, and the opportunity for collecting any more of these will be for ever lost to the geologist.

Mr. Murchison then quitted the chair, and was succeeded by Dr. Buckland, who took this opportunity of mentioning the establishment of Mr. Vander Meylen, at Brussels. That gentleman had devoted, in the most praiseworthy manner, his time and fortune to the advancement of science, by making large geographical and geological collections, for the purpose of diffusion over the world, by means of exchange with societies or individuals. Dr. Buckland advocated such a mode of obtaining maps and specimens to the different provincial societies of the United Kingdom.

Mr. Fox then exhibited his extraordinary experiment of the change of the yellow into the grey sulphuret of copper, an account of which he had given at a previous meeting. He then made some remarks upon the electro-magnetism of veins. It was plain that when a rock contained mineral matter, the rock and its contents must be in different electrical states, so that electricity must exist in very great activity in the interior of the globe. He referred to his experiments recorded in the Transactions of the Geological Society. He alluded to the north-east and south-west directions of the Cornish veins, and he had ascertained that there are Voltaic currents perpendicular to the magnetic meridian. Tin is found to exist in veins, or in different parts of the same vein; and in experimenting, he had found that metallic tin went to the positive, and oxyde of tin to the negative pole of the apparatus. He was also struck with a kind of polarization in the disposition of the matter of veins; thus, iron and copper presented distinct relations to each other; the grey sulphuret of copper was uniformly found above the yellow; the quartz of N. and S. veins was striated, that of E. and W. veins not so. The phenomena of the intersection of veins were also spoken of; the old supposition, that one vein must be older than the other, need not be resorted to in all cases, as it could be proved that crossing veins were often of simultaneous origin.—Dr. Buckland pointed out Mr. Fox's experiment as an illustration of the simplicity of the means which nature had adopted in her most subtle operations, and expressed his hope that this new application of electro-chemistry to geology would furnish a series of results of paramount importance. Indeed, one of the great benefits conferred by the British Association on science, was the bringing forward individuals who had devoted themselves in private to scientific investigation and experiment, which often, as in the case of Mr. Fox, opened the portals that led to new views of nature and her operations. He had now to introduce to the notice of the Section another gentleman, who had for many years, in private seclusion, occupied himself in experiments of a novel and extraordinary character, and also making use of apparatus of the most simple description. He then presented to the notice of the meeting Mr. Cross, who would give a verbal account of his most singular proceedings.

Mr. Cross then stated, that he had devoted a great part of his life to the pursuit of electricity, and that he came before the Association merely in the character of an electrician, being by no means a geologist, and but in a moderate degree a mineralogist. But, being early impressed with the notion that it would be desirable to produce, if possible, a long-continued, undiminished electrical action, he had set himself to work, and after many trials he had constructed an apparatus, which had for no less than an *entire year* retained its electric energy, and this by the agency of pure water only. He had also conceived, that it being by long-continued processes that nature produced most of the effects which we observe, it might be possible to form substances similar to what she affords, by adopting a mode like hers. His attention had been directed to a cavern in the Quantock Hills, in which he had observed calcareous spar incrusted on limestone, and arragonite on clay slate: these minerals had evidently been formed by the water which percolated the rocks. Some of this water he brought to his house, and presented it to the action of his Voltaic apparatus; for nine days he anxiously watched for a result, but no visible one offering, he had almost given up the experiment, when, on the tenth day, to his great delight, he succeeded in procuring minerals the same as in the cavern. He was thus encouraged to prosecute further experiments; and, in the course of his investigations, he found that light was unfavourable to the perfection of crystals, he being enabled, in a much shorter period, and with much weaker electric power, to produce them in the dark. He formed several crystals of metallic minerals, but his most successful experiment was the production of quartz from fluo-silicic acid, and his inspection of what has been perhaps never before observed by mortal eye, the process of crystalline developement from the beginning. He had traced a quartz crystal, first, as a hexagon marked upon the matrix—then lines radiated from its centre—then parallel lines were formed parallel to its sides—it increased in thickness, but, owing to some disturbance of the operation, the process of forming a single perfect crystal was not completed, for a second crystal grew up and intersected it, offering an additional confirmation of the resemblance of Mr. Cross's process to that of nature, where this penetration of crystals into each other is everywhere to be observed.

It would be extending this report too far to relate all that Mr. Cross communicated to the Section regarding the details of his experiments; but it is impossible to convey an idea of the enthusiasm with which his statement was received by the crowded assembly present. There appeared to be a real *electrical* effect produced upon them; they seemed as if the interior recesses of Nature had been of a sudden laid open to them, and her processes, which had been conceived as past all mortal ken, submitted to their inspection. Mr. Cross was often interrupted during his address with loud peals of applause, which lasted for several minutes after he sat down.—Mr. Conybeare said, that he found himself so excited with the intelligence, that he should not submit his observations on the South Wales Coal Basin; he considered any communication he could bring forward totally eclipsed in interest by the overpowering intelligence brought by Mr. Cross.—Upon that gentleman Mr. Sedgwick passed also a highly eloquent eulogium.—Professor Phillips stated, that he had now hopes of realizing his fondest dreams of geology. He had long conceived that Nature must have some means of conveying solid matter through solid matter, and that this was now proved by Mr. Cross, whose discoveries were of such an importance, that had the British Association been of no other service than in bringing them to light, they alone were worth all the pains it had taken for the advancement of science, and it was its particular business to have experiments like his set on foot, and prosecuted for many years to come.

Professor Phillips then gave a description of a bed of magnesian limestone, which existed beside Manchester. This limestone he had ascertained to be identical with a similar formation, discovered by Mr. Murchison in Shropshire. He described with great ingenuity the mode by which he had traced this identity by means of shells, which were, in some respects, fluviatile, but rather pointed out a formation formed in an estuary. One of these shells presented a similarity to a young Planorbis, it having a left-handed spire. Remains of fish were also discovered. But the most important point communicated, was the relation of the discovery of the Shropshire and Manchester limestones to the future prosperity of the country. The identity of these limestones almost demonstrated that they were at the borders of an *immense coal basin*, extending under the red sandstone of Cheshire, and affording deposits of coal of incalculable quantity, securing to many generations to come a supply of the most important mineral that exists, and dissipating the fears of those alarmists, who imagine the decline of the British manufacturing power is not far remote, from the likelihood of the present coal mines being exhausted. He bore honourable testimony to the exertions of D. C. Phillips, of Manchester, who had assisted him in this most interesting investigation.

After some remarks from Messrs. Sedgwick and Murchison, the Section adjourned till the evening.

Evening Meeting.—Rev. W. D. Conybeare in the chair. Mr. Murchison exhibited a map of England, coloured to represent some phenomena of physical geography, and for the purpose of answering a question proposed by the Association. On a former evening Mr. Phillips had given an account of the boulder stones found in the north of England, and which had been traced even as far as Worcestershire. Mr. Murchison, in his researches in Wales and the neighbouring counties, had not observed these carried to the country bounded by the Severn, nor had he observed any of the silurian gravel carried to the central parts of England. From this he concluded that siluria must have been formed subsequently to this central part, which might have been an island or part of the continent. In this country of siluria he had found the deposits of gravel perfectly local; nor could he perceive in this gravel any recent shells: on the borders of the South Wales Coal Basin were

marks of diluvial action,—fragments of coal strata being thrown off as from a centre. Another proof of the newer elevation of this part of Britain, are the marks of large lacustrine expanses at recent periods. Out of this tract not only do we observe the boulders of granite extending from north to south, but we find fragments of recent marine shells in the diluvium of Lancashire, Cheshire, Salop, and part of Stafford, all diminishing as we approach the Severn. But he was of opinion that these boulders could not have been so diffused when the surface had been dry land, but that the operation must have been effected under the sea, as proved by the presence of these marine shells, and by the fact of boulders having been found on the summits of the sides of valleys, which could not have been brought to those positions save by the agency of currents of the ocean. This later period of the elevation of siluria, must have produced also the present course of the Severn. In concluding his remarks, Mr. Murchison mentioned the possibility of icebergs assisting in the transport of diluvium.—Mr. Conybeare mentioned the fact of chalk boulders being found upon Flat Holm, near Bristol, which stones must have been brought down by the Avon.—As Mr. Murchison was desirous that no discussion should take place on the subject of his communication, a conversation was commenced by some of the eminent geologists present, respecting the relation of the structure of rocks to their strike and dip. Mr. Sedgwick proposed several questions respecting these phenomena in different places; these were answered by Messrs. Griffith, De la Beche, and Hopkins, and gave rise to much discussion. Prof. Phillips concluded the discussion with a number of remarks of great acuteness; but as no general inference was drawn, and as the whole proceedings were in a degree of an unconnected, conversational character, it is not necessary to make any report of what was said, especially as the subject was left open for further investigation, and to be brought forward at future meetings of the Association in a more systematic form.

Section D.—Zoology and Botany.

Upon the Section assembling this morning, it was announced that the Committee had determined to keep the room open till four o'clock, that the papers which remained unread might be finished this day, in order to allow many gentlemen an opportunity of making geological and botanical excursions on the morrow. Dr. Moore then announced his having procured a fish in Plymouth harbour, new to Great Britain, the *Trigla cataphractes*, and Mr. Yarrell confirmed the accuracy of the observations, and stated the species to be common in the Mediterranean.

Dr. Richardson then read the concluding portions of his report. The order Edentata is eminently South American, and only three or four species are met with in North America. The fossil species of Megatherium and Megalonyx, however, are found in both Americas.—The order Pachydermata is remarkable for the size of most of its species, and the number of the extinct species is more than double the recent ones in the New World. Only two genera and three or four species belong both to North and South America. Fossil elephants and mastodons occur in the most distant parts of North America. Although the present race of horses is certainly of European origin, yet fossil bones of this quadruped are met with in Kotzebue's Sound.—Thirteen species of Ruminantia were enumerated, two of which are common to the old and new continents, and have a high northerly range. The North American deer are very imperfectly known. The reindeer reach to Spitzbergen and the most northerly of the American islands, and range southwards as far as Columbia river on the Pacific coast, and to New Brunswick on the Atlantic. Although the musk-ox ranges from the barren lands over the ice to Parry's Islands, it is not found either in Asia or Greenland.—There appears to be nine species of Cetacea, known as North American, and those on the east coast are mostly inhabitants of Europe also, under the same parallels of latitude, especially those of the Greenland seas. On the western side the species are common to Asia also.

The report then proceeded with an account of the Ornithology, which Dr. Richardson said it would be unnecessary to touch upon at so great length or with so much detail as the Mammalia, since the kinds were so much better known, a great majority of them being migratory, and therefore those which lived in the less frequented regions were, at stated seasons, visitants of the more civilized districts. Local lists, however, were still wanting to enable naturalists to trace their geographical limits with precision, and, more especially, our knowledge was very imperfect of those of California and Russian America. Of about 500 species, there were one-fourth to be found in Europe, but not more than one-eighth in South America. Of the former, or those common to North America and Europe, thirty-nine were land-birds, twenty-eight waders, and sixty-two water-birds. Several of the generic forms were peculiar, but only two of the families, viz. the Trochilidæ and Psittacidæ, were not to be found in Europe; and the Hoopoe is the only European representative of the whole order to which the former of these families belongs.—No vultures are common to both worlds, but nearly half the other birds of prey are so, and many of these range over South America also, and indeed the whole world. One-fourth of the Corvidæ are inhabitants of Europe; but the other land-birds, common to both continents, are in much smaller proportions, and not more than two out of sixty-two Sylvyadæ are European. The number of species common to North and South America is very uncertain. Some of the most numerous families characteristic of the former country have few or no species in South America. It is remarkable that only one Trochilus has been described as common to North and South America, although this family is peculiarly characteristic of the latter country; and there are twenty-two species which have been described as natives of Mexico. Dr. Richardson then detailed several particulars respecting the migration of birds, stating it to be his opinion, that the spring movement was for the purpose of finding a convenient place for incubation and rearing the young. The lines of route were influenced by the supply of food to be obtained, and thus the northerly and southerly courses were often over different tracts; and he pointed out the three great lines of route which were to a certain extent determined by the physical features of the country. The absolute number of birds to be found in different countries decreases on receding from the Equator towards the North Pole; but of those which stay to breed in any place, the number increases from the Equator up to the 60th degree of north latitude, where the forests begin to grow thin. But the progress of civilization has already had an influence on the migrations of certain species, by affording them an abundant supply of provisions, where they were before without any. Thus the starlings proceed further north as the culture of the Cerealia continues to extend in that direction, and the introduction of certain tubular flowers into the gardens of Florida, has enticed new species of humming birds thither from the south. Some details were then given of the distribution of the various families of birds, and a table in the report exhibited the absolute number of species, as well as the number of such as breed in Philadelphia, Massachusetts, and Suskatchewan.

Dr. Richardson pointed out the peculiar facilities which America afforded for tracing the course of birds from one end of their migration to another. He did not propose to touch upon the reptiles, fishes, and remaining departments of zoology; and concluded his report by mentioning certain *desiderata* to our knowledge of North American zoology, to which he wished to call the attention of naturalists, who might have an opportunity of attending to this branch of the science.

A discussion was then opened by Mr. Carpenter, who gave the Section an exposition of Dr. Pritchard's views on the criteria by which species are to be distinguished in Zoology and Botany. From Dr. Pritchard's definition of a species it would be evident that the object of inquiry would consist in determining what were those principal characteristics of each, which could neither be lost nor acquired by the influence of external causes. It had now become evident that the determination of specific differences from structure alone was a very uncertain criterion; and he noticed the reduction of many species which had lately been effected both in Zoology and Botany by several naturalists, who had engaged in the more accurate examination of numerous varieties, and had paid greater attention to the conditions under which certain changes were produced. He then proceeded to consider four distinct heads of inquiry, under which he arranged Dr. Pritchard's views respecting the circumstances which might be taken into consideration for a more accurate discrimination of species than that which is permitted by their external characters alone:—1st. He pointed out the advantage of employing the general laws or arrangements regulating the functions of each tribe, because there were cases where the more minute distinctions of structure were inappreciable, excepting so far as they were to be recognized by a diversity of function. Of these the most important was the average duration of life for each species; thus, circumstances connected with their reproduction, as the number of their progeny, the times and frequency of breeding, utero-gestation, intervals between laying and hatching the egg—all these circumstances differ materially in species which are most closely allied in structure: thus, the period of utero-gestation is sixty-two days in the dog and ninety in the wolf. Man is well distinguished from all animals the most nearly allied to him, by the average duration of his life and the principal epochs of it; and, in these respects, the identity of the whole human race was shown by the general uniformity of these circumstances in every nation. There is, however, an immense difficulty in applying these conditions as a test of specific difference in the great majority of cases, from our limited knowledge of facts. It seems probable, that the chief characteristic by which any group is particularized, would be less liable to vary than any other; and here he instanced the periodic regularity of menstruation in the human race as a distinguishing characteristic of our species. 2. The conditions attached to hybridity might be employed as an accessory means of determining true species. Contrary to the opinion of Hunter, it was now known that hybrids were sometimes fertile; but Dr. Pritchard asserted that this was only in case of the female receiving impregnation from one of the parent breed, and that they were known never to propagate between themselves. In plants the limits of hybridity appeared to be somewhat more extended, and it was believed that some were capable of ripening their seed to the third or fourth generations; but still these instances might perhaps have resulted from extreme varieties of a common species; and he was inclined to accept the tendency to sterility in hybrids as a sufficient test for the determination of the actual distinction of species in their parents. 3rd. He proposed as a query, the possibility of employing pathological considerations as a means for discriminating species, as, for instance, the differences observable in the action of morbid poisons. Some contagious diseases were communicable to different races, whilst others were not so. In plants very closely allied in external characters, some were attacked by particular diseases, which did not affect the others: but Mr. Carpenter observed, that it would be very difficult to say whether the same disease might not appear in different individuals with very different symptoms, and thus be mistaken for distinct diseases. It was now supposed that the cow-pox was only a modified form of the small-pox. 4th. We might employ the psychical endowments of particular tribes as a means of discrimination, those of sense and perception, instincts and propensities, habits, &c. In these there was a surprising uniformity, though the observations must be restricted by certain conditions, as was shown by the difference observable in the different races of the dog. In this case, however, these differences were possibly all subordinate to one general feature in the character of this animal—viz. his innate attachment to man. The qualities here instanced were more especially applicable to the discrimination of closely allied species of insects—as among wasps and bees. It appeared to him distinctly established, that the whole human race was composed of one only species.

Mr. P. Duncan, in commenting upon the views of Dr. Pritchard, considered that the adoption of instinct and habit, as a criterion of specific distinction, was good; and in ornithology he noticed particularly the nidification of birds as of great importance.—Mr. Eyton stated, that he had obtained hybrids between the common gander and a female Chinese goose, the *A. cygnoides*, and that these hybrids had bred between themselves. He also had

fertile hybrids from the Chinese boar and common pig.—Mr. Vigors was much inclined to Mr. Hunter's view of the subject, and thought the non-fertility of hybrids an excellent test for the discrimination of species. The exceptions which were occasionally brought forward, were frequently found to be inconclusive, from some want of precaution in carrying on the experiments, as he knew, from some cases which had occurred at the Zoological Gardens. Of the auxiliary principles proposed by Dr. Pritchard as means for discriminating species, he thought that of disease of much consequence. He would add to the list already specified, the probability that parasitic animals might be studied with a view of determining the specific differences of the animals on which they feed, and, among birds in particular, each species appeared to have a peculiar parasite.—Dr. Riley, after comparing the various definitions of a species as given by Lamarck, Linnæus, Cuvier, and Blumenbach, declared his conviction that the theory of Hunter was totally untenable; and that, according to Dr. Pritchard's views, a species ought to be determined, as it were, upon metaphysical considerations, which would seem to imply that each particular function might be the means of producing the organ on which it depended, and thus we might arrive at the doctrine which supposes it possible to create species at will. After alluding to the great differences which subsisted between animals of different countries, and the vast variety of shades of resemblance which subsisted between those of certain groups, he expressed his opinion that it would ultimately be found necessary to abolish the term species altogether, and adopt the hypothesis which allows of the more gradual passage of one form to another.—Mr. Yarrell believed it was at least *almost always* true that hybrids were unproductive. On the Continent this rule was so universal with respect to the mule, which was there bred to a large extent, that the few cases in which it was believed to have occurred, might very reasonably be supposed to have originated in some accident or oversight. Among birds he mentioned an instance of two species of goose, (*Anas boschas* and *acuta*) which had produced fertile hybrids. With respect to fish, Isaac Walton's supposed hybrids were now well known to be good species; and he believed it to be a very difficult circumstance for a hybrid fish ever to be produced. He knew of no example of the kind; and, indeed, if it were likely to happen, our ponds would soon become full of hybrids, since the influence of the male roe was conveyed to a great distance by the water after it had been deposited.—Dr. Pritchard observed, that as some allusion had been made to the menstruation of monkeys, he felt very doubtful of the fact, which was asserted by Lesson and F. Cuvier, but denied by Blumenbach; and he should be very glad to receive some positive information on the subject.

Professor Henslow alluded to the views of De Candolle, on the production of hybrid plants; and Mr. Carpenter having replied to some of the observations which had been made, the debate terminated.

Mr. Phelps read a communication 'On the formation of Peat,' with reference more especially to a tract in the low lands south of the Mendip hills. This tract had formerly been kept perfectly drained by the Abbots of Glastonbury, and they, in consequence, possessed one of the richest pasture lands in Great Britain. Subsequent neglect had restored this land to the state of a morass, from which it had been again reclaimed. Mr. Phelps then entered into several details respecting the growth, properties, and uses of peat, exhibiting specimens in illustration of his account. Trees had grown on the spot after it was reclaimed, for the first time, and subsequently embedded in the fresh formation. It was specified that Roman remains had been found there under a deposit from seven to twelve feet deep.

Mr. Babington, Dr. Crook, Mr. Taylor, and Sir Francis Mackenzie, alluded to the existence and accumulation of bogs on the sides and slopes of mountains, as well as in fresh water lakes where Mr. Phelps had explained their mode of formation.—Mr. Mackay exhibited some specimens of the wood, bark, leaves, and cones of the Scotch pine, *Pinus sylvestris*, which had been found in a peat bog sixteen feet below the surface of the soil, and over a depth of five feet of peat, in King's County, Ireland.

Mr. Mackay then read a communication he had received from Mr. Nuttall, 'On the management of the Pine Tribe.' Where the plants grew too rapidly, or out of proportion to their rooting, he found that this defect was corrected by breaking off the fully-developed buds in the spring, except from the short branches. Larches he had cut down to a strong lateral branch, which ultimately became a choice tree. He remarked, that he had observed that resinous trees escaped the effects of lightning, whilst others were struck.

Dr. Crook stated, in reference to this observation, that he knew an instance where two larches had been shattered by lightning during a thunder storm.—In addition, Mr. Mackay informed the Section, that he had raised specimens of *Pinus Canariensis*, in Ireland, which had been cut down to the ground by a severe frost, and afterwards had thrown up four shoots from the stool.

A communication was read from Mr. Forbes, in which he mentioned the names and localities of sixteen species of shells new to Scotland, and concluded with the remark that those Testacea, which, on the east coast and in the Irish Sea, were inhabitants of deep water, were often found on the west coast far above low water mark.

Dr. Lloyd read a communication on the Marsileaceæ, in which he described this group as making the nearest approach to flowering plants of all the Cryptogamic tribes. He then entered into a detailed examination of *Pilularia globulifera*, describing the involucrum as consisting of three coats, and gradually opening by four valves, so that several weeks were occupied in admitting the escape of the seed. He then described the two kinds of grains contained in the involucrum as analogous to pollen and seeds. The latter germinate when taken from the involucrum previous to their bursting; and the others do not resemble abortive grains, as some consider them. On placing the seeds in water, they swell at the apex, and a green point protrudes either in the direction or perpendicular to the direction of their axes, and this becomes a leaf half an inch long. White radicles then appear at the opposite side. The leaf always proceeds from a determinate point. There is a bundle of minute ducts in the centres of the stem and leaf, but no spiral vessels.

An abstract of a paper from Mr. P. Teale was read, '*On Alcyonella stagnorum*;' and very beautiful preparations and specimens of it were placed on the table. It was found in great abundance from August to November, in 1835, in a small pond near Leeds. It was supposed to be new to Great Britain.

Specimens of the insect called the 'Vegetating Wasp,' was exhibited by Mr. Yates, who stated, that he had received them from Jamaica. It appeared, that this insect was infested by a fungus allied to sphæria, which attached itself to its body, even, as was asserted, during life.—Mr. Hope considered the insect to belong to the genus Polystrix; and mentioned, that several Curculionidæ were liable to be similarly infested.

Dr. Riley mentioned a circumstance in the osteology of the two-toed ostrich, which had escaped observation. He showed, that the third toe was really present in a rudimentary state, concealed by the integuments. It consists of two phalanges, and is articulated with a well-defined condyle of the tarsal bone, and projects on the same plane with the other two.—Mr. Hewitson exhibited various straws, containing parasitic insects.—Mr. Bowman presented a specimen of *Spiræa hypericæfolia*, gathered on a limestone soil, near Denbigh, where it appears to have become perfectly naturalized.—Dr. Tyacke exhibited specimens of *Lamium intermedium*, found near Edinburgh, and in several parts of the Highlands and Hebrides.

A communication was then read from Dr. Corbet, detailing the results of several experiments made, by causing plants to imbibe the prussiate of potash, in a solution of eight grains to the oz. of water, and then testing the parts affected by sulphuret of iron. It was remarked, that this method has been already detailed in the *Gardener's Magazine* a few years ago; and Dr. Corbet stated, that he had found that Dr. Daubeny had likewise alluded to it in a paper in *Jamieson's Journal*; but having obtained his own results, independently of any previous knowledge of these facts, he thought they would be interesting to the Section, as confirmatory of the experiments of others.

Section E.—Anatomy and Medicine.

Dr. Hodgkin read a paper on the connexion between the veins and absorbents. He observed, that the Committee appointed to investigate this subject had been fortunate in procuring subjects, in whom the lymphatic system had been well developed. There was great difficulty in injecting the lymphatics, it requiring a sharp eye and a steady hand to be anything like successful. Mercury, injected into the lymphatics, will sometimes pass off by the veins, and some believe that there is a natural communication between these structures. In injecting subjects at Guy's Hospital, it was found that the mercury passed easily from the glands into the veins, in very recent subjects. The idea of transudation through the sides of the vessels, he said, must be rejected in mercurial, though it probably took place in aqueous injections.

Mr. Bracy Clark, in injecting the vessels in a horse, found a direct communication between the receptaculum chyli, and the lumbar veins. If water is thrown into the arteries, it will almost immediately fill the lymphatic vessels.—Dr. Hodgkin had seen lymph flowing in the thoracic duct, tinged with blood.—Mr. King had observed the fact, that the thyroid gland contained a number of small cells, which were filled with a peculiar fluid, and it is almost certain that there is a communication between these internal surfaces and the lymphatics of the organ.—Dr. Hodgkin gave it as his opinion, that the communication between the veins and lymphatics occasionally happened, but that they were not found at will.

Dr. Reid, of Dublin, then read to the Section a paper, entitled, 'A short Exposition of the Functions of the Nervous System.' He observed, that the anatomical examination of the human frame brings to view a complicated structure, consisting of a great variety of organs. These are held in reciprocal communication by means of nerves, for, upon the division of nerves going to supply any part, that part is immediately deprived of all vital influence upon the rest of the frame. It becomes itself then subject to the laws of inorganic matter. The nerves, therefore, being the means of communicating vital influence to all the parts, however minute, of the human body, it becomes necessary to examine the functions of these substances, and how they are distributed through the general frame, in order to enable the physician justly to appreciate the actions of the organs, whether morbid or healthy, while life continues.—In studying the phenomena produced by the nervous structures, it will be found, that all phenomena are not common to all nerves; but that some phenomena may be traced to the influence of certain nerves exclusively, while other phenomena are found to be controlled by a different system. Thus, if three nerves are found attached to an organ, one of these being divided, the organ may be deranged in its function of assimilation; another nerve being divided, the power of motion may be extinguished, and the third being cut, the organ may be deprived of sensation. The human frame being composed of a number of different organs, and the actions of all these being necessary to the general economy of the animal, it is evident there must be some medium of reciprocal communication, so as to keep up that harmonious activity throughout the frame, which constitutes health. The nerves form this medium of communication, and it will be found that these parts of the animal structure are distributed into three natural divisions. The first (said Dr. Reid) which I have denominated the ganglionic system, consists of that series of ganglion formerly denominated the sympathetic nerve and its appendages. Professor Panizza, of Pavia, has demonstrated the incorrectness of the supposition, that the branches of the first cervical ganglion of this system, which ascend along the carotid artery, and, entering the cavernous sinews, communicate with the sixth pair and enlarge them. He says, the branches of the intercostal or sympathetic nerve are merely entwined round the sixth pair, and may be detached without injury to either, It therefore appears, that these branches are sent up from the central system of ganglions to perform their functions in the parts to which they are distributed,

and are actually not derived from the brain, but are sent to perform their peculiar office in the brain and the adjacent parts. This system of nerves appears to be the first formed, and seems coeval with the *funetum saliens*. It thus becomes intimately connected with the organs of circulation, forming that nervous net-work around the vessels, which follows their most minute ramifications. As the ganglionic system of nerves differs from the cerebral and spinal nerves in appearance, properties, and distribution, it is natural to infer, that its functions also differ. Weber has observed, that the vascular system is developed in proportion to the sympathetic nerve, and seems to imply, that the greater power of reproduction in organized beings, apparently destitute of nervous matter, is to be attributed to the nervous matter diffused through them.

At the close of Dr. Reid's paper, a discussion ensued, respecting the efficacy of pressure on the peritoneum in cases of epilepsy, which Dr. Reid stated he had never known to fail in recovering the patient.

Dr. Macartney exhibited to the members a portable Probang.

The last paper was on the muscles and nerves of the eyeballs; but it would be unintelligible to our readers, if given, unaccompanied by the diagrams by which it was illustrated.

Section F.—STATISTICS.

H. Hallam, Esq. in the chair.—Professor Forbes described the result of his application of Quetelet's principle, of describing the increase of stature, weight, and strength by curves. He had carefully experimented on English and Scotch students, between the ages of 14 and 25 in the University of Edinburgh. The general laws of the curves were nearly those established by Quetelet. In the comparison of nations, the Irish appeared to be the first in all physical developements, the Scotch ranked next, the English were the lowest of the three nations, but they were above the Belgian.

It was generally remarked, that the data for the Irish and English were not sufficiently accurate to justify any general conclusions.

A paper from Dr. Collins on periodicity of birth was read; it was too exclusively medical for general readers, and the principal tables have been already published in the Doctor's treatise on Midwifery.

Baron Dupin exhibited two maps of Britain, coloured on Guerry's plan, to illustrate Criminal Statistics, and their relation to density of population and education. The latter was both the more prominent, and, in relation to subsequent discussion, the more important branch of the Baron's observations. He drew a distinction between moral and physical education, describing the latter as an indifferent instrument capable of being applied either to good or evil. He then briefly glanced at the proportion between juvenile offenders in England and France, stating as a general result, that the young criminals of England more frequently reformed than those of the continent.

We have been induced to compress the Baron's statement, both because it was understood that it would be soon published, and because we wish to give very copious extracts from the most important communication made to the Section, the 'Report of the Manchester Statistical Society on the State of Education in the Borough of Liverpool.'

The Committee appointed by the Statistical Society of Manchester to inquire into the state of Education in the Boroughs of Manchester, Salford and Bury, having brought their labours to a close in October, 1835, it was determined that a similar inquiry should be prosecuted in the borough of Liverpool, and a Committee, consisting of Messrs. W. R. Greg, W. Langton and H. Romilly, was appointed to carry this object into effect.

"The difficulties," said the Report, "were greater than those which had occurred in the case of Manchester and Salford, though for the most part of the same nature; and although presenting themselves in a variety of shapes, almost all originated in the same cause, viz. a distrust, on the part of those from whom information was sought, of the motives and objects of the inquirers. In many cases it was suspected that the inquiry emanated from government, who meditated the adoption of measures on the subject of education, which might affect the interests of those connected with existing establishments.

"Many of the masters had strong objections to the inquiry, on the ground that it was only preliminary to the interference of government, of which they stand in awe. One elderly individual observed, 'If government choose to legislate on education, the schoolmasters have a right to compensation for the loss of their vested rights.' He added, that for his part, he should be content with a small pension, to which he was fairly entitled, inasmuch as he had been all his life at it, and, in consequence of the stir lately made about education, had more difficulty than ever in getting a living by it.

"In almost all cases there was an apprehension, more or less definite, that the information was sought for by political or religious partisans, and was to be used as an instrument in effecting some political or sectarian purpose.

"A suspicion as to the object of the inquiry, and backwardness in giving the information asked for, was most common in the wealthiest class of schools; but, in the outset of the inquiry, and amongst the inferior schools, party spirit, evidently excited by a large meeting held 29th October, 1835, followed by other proceedings, was found to rage with considerable virulence. In one of the Dame Schools the mistress stated the feeling between Protestant and Catholic to be so violent, that, on the admission of a new scholar, she frequently received injunctions from the parents not to allow the child, if a Catholic, to sit on the same form with Protestant children, or if a Protestant, to sit with the Catholics. In answer to the question 'How many classes have you in your school?' one or two have replied 'Two; Protestant and Catholic.'

It appears from the labours of the Committee—

"*First.*—That the whole number of children, male and female, attending schools of one kind or another, is 33,183, which is about fourteen and two-fifths per cent. of the whole population.

"*Secondly.*—That of this total number of 33,183, about 6,000 are children, either under five or above fifteen years of age, and that, consequently, the number of children between the ages of five and fifteen attending school is about 27,200.

"Now, if 57,500 (or one-fourth of the whole population,) be assumed as the total number of children between the ages of five and fifteen in the borough, it would then appear that, of this number, 27,200 are receiving some kind of instruction in schools, and 30,300 (or more than one-half of the whole,) attend no schools whatever.

"*Thirdly.*—It appears that of the total number of children receiving education,

17,815, or about 7¾ per cent. of the population attend day or evening schools. *Only*

11,649, or about 5 per cent. of the population, attend *both* day and Sunday schools, and

3,719, or about 1¾ per cent. of the population attend Sunday schools *only*.

33,183

"The number of children now ascertained to be receiving some kind of education, is greater by 15,500 than the number stated to the government in 1835.

"The dame schools, and common girls' schools are, with one or two exceptions, kept by females, and the common boys' schools by men. This, indeed, has formed one ground of the division into boys' and girls' schools.

"With few exceptions, the dame schools are dark and confined; many are damp and dirty; more than one-half of them are used as dwelling, dormitory, and school-room, accommodating, in many cases, families of seven or eight persons. Above forty of them are cellars.

"Of the common day schools in the poorer districts it is difficult to convey an adequate idea: so close and offensive is the atmosphere in many of them, as to be intolerable to a person entering from the open air, more especially as the hour for quitting school approaches. The dimensions rarely exceed those of the dame schools, while frequently the number of scholars is more than double. Bad as this is, it is much aggravated by filth and offensive odour, arising from other causes.

"On pointing out to one mistress of a dame school, the unfavourable effect these circumstances must produce upon the children, she replied, 'They thrive best in dirt.'

"A circumstance which proves the unwholesome condition of many of these schools, is the very rapid spread of infectious or epidemic disorders, which occasionally make their appearance in them. The measles, scarlet fever, small-pox, and ophthalmic affections, never attack one scholar alone. Frequently, one-half of the scholars are affected at the same time; and some of the schools have been visited at times when two-thirds of the children, usually attending, were detained at home by such complaints. These cases have invariably occurred in the most unhealthy and ill-ventilated schools, while, in schools more favourably circumstanced, it has rarely happened that more than three or four of the scholars have been absent, on account of illness, at the same time.

"In a garret up three pair of dark broken stairs, was a common day school, with forty children, in the compass of ten feet by nine. On a perch, forming a triangle with the corner of the room, sat a cock and two hens; under a stump bed, immediately beneath, was a dog kennel, in the occupation of three black terriers, whose barking, added to the noise of the children, and the cackling of the fowls, on the approach of a stranger, were almost deafening. There was only one small window, at which sat the master, obstructing three-fourths of the light it was capable of admitting.

"At another school, also in a garret, very much dilapidated, and only nine feet by twelve feet, were thirty-eight scholars; not more than six of these had any book; a desk, at which only five boys could be accommodated at the same time, was all the provision for writing and arithmetic. The room below was in the occupation of a cobbler, whose wife lay ill in bed of a fever, himself pursuing his avocation near to the bedside.

"Another school is worthy of description. The descent is by a flight of narrow steps, fifteen inches in width, and covered with filth; the room is naturally dark, but is rendered doubly so, from the dirt without and the steam within the windows; the forms are composed of four old bedstocks, resting on brick supports: the writing desk is a three-legged table or stool, accommodating only one scholar at a time. The master, an Irishman, represented himself as a 'graduate of the University of Munster, the first place for scholarship in all Ireland.'

"In one poor school, an old form supplied the place of a desk; three small children were kneeling on the floor to write at it, and two taller ones sat on the floor, with their legs thrust under it.

"In 134 out of 194 schools Grammar is taught.
110 .....194..... Geography.
45 .....194..... History.
22 .....194..... Mathematics.

"It has also been found that in a large proportion of the dame schools religious instruction is professed to be given, (this term being however, in almost every case, considered as synonymous with the repetition of a catechism,) and that religious instruction, professing to be something more than the mere repetition of a catechism, is given in 136 out of 194 common day schools.

"Some teachers object to give religious instruction at all, and in most of the schools where religion is professedly taught, nothing more is attempted than the repetition of a catechism once a week.

"In one school the master professed to teach the Catholic, Church of England, and Swedenborgian doctrines. In another, the scholars were said to be taught according to their respective creeds. In a third they were allowed, once a week, to learn any catechism they brought with them. A mistress of one of the dame schools, who taught both the Catholic and Protestant catechism, said she 'took care to keep both a-going together, and then no harm could come of it.' One master professed to teach the Protestant and Catholic doctrines, and some other which he said he did not rightly understand himself.

"It appears that, in 185 out of 438, (the total number of the two classes of schools,) the masters, upon being questioned on the subject, professed to teach Morals; but the profession, in the mode in which it was generally made, seemed to spring from an apprehension that the question was one involving the respectability of the school, and our agent could find no evidence that systematic training in the principles of morals was ever attempted, or even supposed to be possible.

"In the poorest schools, no pretence is made to teach morals, and many masters have no idea what teaching morals can possibly mean. The generality of teachers indeed entertain very imperfect notions on this subject. The prevailing idea is, that morals are best taught by visiting the more flagrant deviations from rectitude with the rod.

"To show how imperfect is the knowledge of some masters on the subject of morals, one master being asked if he taught morals, observed, 'That question does'nt belong to my school, it belongs more to girls' schools.'

"It has been seen that in the dame schools, to teach the children to read is (in every case but one or two) the whole of what is professed. In the common day schools much more than this is professed, but little more is actually done. The pupils are in very few cases obliged to go through any course of instruction prescribed by the master. They may learn as little as they or their parents please. A separate charge is made for each subject, and consequently the fewer the subjects a child is instructed in, the smaller is the cost of his schooling. It was found that in thirty-six schools, taken promiscuously, having 1563 scholars,

1016 were receiving instruction in reading only.
299 ..... reading and writing.
238 ..... reading, writing, and arithmetic.
10 ..... reading, writing, arithmetic and some other subject.

"It is not uncommon to find the mistress of a dame school gone out for the day, and her school in charge of some neighbour or neighbour's child. Sometimes she is found washing, at the back of the house; at other times, the washing and drying is carried on in the school.

"On one occasion, the children of a common day school were found playing in a garret, and it was stated that the master had been away drinking, for several days together.

"Dame schools are almost universally ill supplied with books. The poverty of the mistress renders it quite out of her power to provide them, and the parents neglect to furnish their children with them, either from the same cause or from indifference. In many of those schools which are not wholly destitute, the books are of such a mixed character as to defy enumeration, consisting of old magazines, of parts of novels or sermons, and sometimes even of political pamphlets.

"The mistress of a girl's school expressed a hearty wish that this inquiry might lead to putting down all Catholics and Dissenters, whom she designated as a bad disaffected set. 'I hate the Dissenters worse than the Catholics,' said she, in the presence of her pupils. 'I once set on foot a subscription for a poor man who was a Dissenter, and he had the impudence to say that I had kept back part of the subscription money, so that (raising her voice, and giving strong emphasis to the word never,) *I determined never to do a good action again, and I never will.*' This individual had previously insisted upon the care she took of the morals and religion of her pupils.

"Of the proximate causes of the inefficiency of this class of schools, those which appear to the Committee to be the most prominent, are, first, the want of adequate means for their support; and secondly, the non-existence of a class of capable and willing teachers, who take an interest in their occupation: and the Committee would here observe, that each of these causes in some degree re-acts upon the other: that the want of funds is one (although not the only) cause of the want of proper teachers; and that the general incompetency of the teachers, and the consequent inferior quality of the instruction given, is in many cases a reason why the parents will not consent to make a greater pecuniary sacrifice to have their children educated.

"Deficient remuneration of teachers was a great cause of the evils already stated. Two teachers of dame schools were girls of thirteen years of age, one of whom had been left by her father, after his wife's death, to support herself and an infant brother; others of the respective ages of seventy-five, eighty, and eighty-three, were met with.

"A simple calculation shows that the only ostensible means for the support of 244 dame schools are payments from the scholars, amounting, on an average, to little more than six shillings a week for each school. A similar calculation shows that, in the case of the common day schools, a weekly sum of twenty-five shillings is all that could be obtained for the support of a single school, with the average number of scholars, and we know that very much less than that is in reality obtained; for, in forming the table, it has been assumed that each scholar pays the whole charge for instruction in reading, writing and accounts, whereas, (as we have already stated,) a very large proportion of the children are instructed in two or in one only of these subjects, and pay only in proportion to the amount of the instruction. The following extracts from the report of our agent throw additional light on this subject.

"'In thirty-six common day schools, several of which were of the better description, out of 1563 scholars, 1016 were paying for learning to read only, 299 for learning to write, 238 for instruction in accounts, and 10 for grammar or geography. This afforded to each master about 17*s.* a week, assuming the whole to be duly paid, (which is by no means the case,) making no allowance for holidays, and putting out of consideration the fact that, low as the terms are, many masters agree to take less than the terms quoted. Many parents never pay, and it often happens that children, after remaining two or three weeks at school during which no money is forthcoming, are sent back to their parents. In some cases, where the parents are sick or in difficulties, the master consents to retain the children, and to take his chance of payment at some future time.'

"'One master, whose school is in a cellar, being asked what his terms were, replied, 'Why, I only charge sixpence for the readers, ninepence for the writers, and one shilling for the counters.' Surprise being expressed that his terms were so high as compared with those of his neighbours, he explained by saying, 'It's very true they're above the common, but then we're good creditors—the weeks they have it they pay, and the weeks they have'n't it, why we look over it.'

"'No less than ten of the mistresses of dame schools, in the parish of Liverpool alone, acknowledged to being in the receipt of assistance from the poor-rate; and such is the poverty and destitution of some of these schoolmistresses, that they cannot even provide forms for the children to sit on.'

"In concluding their observations on this branch of the subject, it may be proper for the Committee to remark that there can have been no exaggeration in the picture which has been drawn of the defective state of the dame and common schools; indeed, considering that most of the facts, tending to the conclusion of their inefficiency, have been derived from the testimony of the masters and mistresses themselves, who would naturally exhibit their schools in the best possible light, bringing forward the good, and concealing the bad points, the truth is more likely to be understated. With respect to the number of the scholars, our agent did not fail, wherever it was practicable, to put the accuracy of the master's statement to the test by counting them himself.

"One master, who had stated that he used the globes, was asked if he had both or one only,—he replied 'Both; how could I teach geography with one?' Being further questioned on the subject, it appeared that both were in his opinion necessary, because one was supposed to represent one-half, and the other the remaining half of the world.

"Some were more honest—one conscientious teacher of a common boys' day school, an Irishman, being asked if he taught grammar, replied, very candidly, 'Faith, and it's I that don't; if I did, I must *tache* that thing I don't know myself.'

"Much difficulty was experienced in obtaining the numbers in some of the dame schools, from a notion that is prevalent among the mistresses that it is unlucky to count their scholars. One had conscientious scruples, and was deaf to persuasion, saying that it would be flat flying in the face of Providence. 'No, no,' said she, 'you sha'n't catch me counting; see what a pretty mess David made of it when he counted the children of Israel.' The number was afterwards obtained without doing violence to her principles.

"The number of charity schools, in the borough of Liverpool, forms a much larger proportion of the whole number of schools of all sorts, than in either of the towns previously examined by the society. More than one-third of the whole number of children returned, as receiving instruction, of one kind or another, are educated in charity schools; but it ought to be observed, that in the great majority of these schools, the scholars themselves contribute something towards the expense of their education.

"In nearly all of them, the monitorial system is pursued; and in many cases, the instruction is left greatly too much in the hands of the monitors. It is true that the masters do all that can reasonably be expected from them, but, from want of good general management, too much of their time is occupied otherwise than in teaching, much being daily wasted in calling over names, in noting down absentees, in filling up notes to the parents of absentees, desiring to know the causes of absence, and in registering the answers to such notes. These duties, added to those which arise out of the general superintendence of the school, leave the masters little time to attend to the direct instruction even of the senior classes. The consequence of all this is, that too much devolves upon the monitors, who are not sufficiently instructed themselves, to be qualified for the task of educating others.

"In the case of the two schools, supported by the corporation funds, a decision of the town council, formed since the termination of this inquiry, has sanctioned the principle adopted in the government schools of Ireland, viz. that of encouraging all children, (without reference to diversity of religious opinion in the parents,) to come and participate in the advantages of moral and intellectual culture. These two schools form an exception, therefore, to the observation which has been made, with reference to the *generality* of Liverpool charity schools. The former are the schools of the community at large, the latter are the schools of particular religious bodies, instituted for the exclusive use of their own members.

"There are in the borough, seventeen infant schools, having 1118 male, and 1087 female scholars, chiefly between the ages of two and six or seven.

"There are seventy-five Sunday schools, of which

27, with 6311 scholars, are connected with the establishment.
2, with 700 are Roman Catholic.
46, with 8350 are connected with churches of various Protestant Dissenting communities.

"It also appears that thirty-five of these schools, having 10,068 scholars, (or nearly two-thirds of the whole number of children attending Sunday schools,) are connected with charity day schools.

"The Committee will now state, in more general terms, the conclusions to which their inquiries have led them.

"*First.*—More than one-half of the whole number of children in the borough, are receiving no education in schools, either really or nominally.

"*Secondly.*—Of those who do attend school, more than one-third are the children attending dame and common day schools, some of whom acquire nothing by their attendance at school, to which the term education can reasonably be applied, and, with few exceptions, the remainder receive an education of the very lowest description.

"*Thirdly.*—There is in the dame and common day schools,

"First. An universal want of school rooms, fitted to receive the children, and a very insufficient supply of books and writing materials.

"Second. A very frequent want of discipline and subordination amongst the children; and of respect and esteem for their teachers; and a total absence of any uniform system of instruction.

"Third. A body of teachers who, with few exceptions, are of the lowest class, who have received no preparation for their task by previous education, whose competency has been submitted to no test, and who are, in fact, totally unqualified for their situation, both from want of knowledge, and want of moral influence over the children. The office of schoolmaster is almost universally undertaken by persons who can find no readier means of subsistence; there is much competition between the masters, and, in consequence of apathy on the part of the parents, as to the quality of the education their children receive, this competition shows itself in a reduction of the terms for teaching, and seldom or never, in an endeavour to raise the condition of the school.

"*Fourthly.*—Referring to what they have said under the two preceding heads, the Committee feel convinced that improvement in this class of schools is hopeless, so long as they remain without assistance and direction from some body, vastly superior, both in pecuniary means, and in intelligence, to those in whose hands they now are.

"The two great desiderata of those schools are—

"First. A supply of proper school rooms, and school books.
"Secondly. A supply of competent teachers.
"So long as these do not exist, not even the first steps towards an efficient system of education can be made, and there is no ground to hope that they ever will, or can be supplied by the unassisted efforts of the working classes themselves.
"*Fifthly*.—The remaining schools, for the education of the children of the lower classes, consist chiefly of charity schools, some of which have infant, and most of which have Sunday schools attached to them; and receive, within their walls, about forty-five per cent. of the whole number of children attending school, in the borough, supported, in great part, by the funds of private individuals, by whom they are assisted and directed. The education given in these schools is of a more effective kind. The school rooms are more airy and spacious; and the teachers, of a higher and better educated class, have stronger motives to the zealous discharge of their duties.
"The result of the Committee's inquiries may be expressed in the following condensed form:

12,000	Children of all ages receiving entirely at the cost of the parent, an education of a very low order.
13,000	Children of all ages receiving, partly at the expense of parents, partly at the expense of private benevolence, an education more or less effective, but in all cases, of some real value to the child.
3,700	Children of all ages receiving some instruction in Sunday schools, but no regular education.
4,000	Children of the upper and middle classes, educated in superior private schools.
32,700	Total.
30,000	Children between the ages of 5 and 15 } Receiving no education either really or nominally.

"Taking this as a fair measure of the quantity and quality of the education received by the children of the working classes, in this country, and comparing it with what may done, and what, in other civilized countries, has been done, for the education of the same class, the result is one which cannot be dwelt upon, without some feeling of pain and humiliation."

Mr. Fripp read a similar Report on the State of Education in the Borough of Bristol, but his data being in some respects incomplete, we shall wait for a more perfect report, which is said to be in preparation.

Mr. Wyse, the Rev. E. G. Stanley, and several other gentlemen deprecated in strong terms, the continuance of the present chaos of education in England, and recommended the adoption of Normal schools. The discussion was economic rather than statistical, a departure from strict rule which Lord Sandon condemned.

At three o'clock the Section terminated its labours.

PROMENADE AT THE HORTICULTURAL GARDENS.

This evening there was a Promenade at Miller's Gardens, and those ladies who had not been so fortunate as to obtain tickets and admission to the Theatre, had here an opportunity of seeing the lions. The gardens were generally and deservedly admired. Several marquees had been erected, and a spacious tent served as a refreshment-room.

We shall take the opportunity of recording here the various places and objects which the good people of Bristol threw open to the Members of the Association. Such a list is not without its interest, as characteristic of the place.

INSTITUTIONS: Philosophical and Literary..Infirmary, attached to which is Mr. Richard Smith's Museum†..General Hospital..Blind Asylum..Bristol Library..Library, Baptist College..Medical Library..Commercial Rooms. —CHURCHES: Cathedral..Mayor's Chapel..St. Mary Redcliffe..Crypt of St. Nicholas —PAINTINGS and PICTURES: P. J. Miles, Esq...D. W. Acraman, Esq...Bristol Artists..GARDENS, &c.: Mr. Miller's..Mr. West's Observatory. —MANUFACTORIES: Coal Gas Works..Oil Gas Works..Messrs. Acramans' Chain Cable and Anchor Manufactory and Iron Foundry..Messrs. Acramans' Bristol Scrap Iron Forge and Steam Engine Manufactory..Messrs. Winwood's Iron Foundry and Steam Engine Manufactory..Messrs. Hares' Floor Cloth Manufactory..Messrs. Savages' Sugar Refinery..Messrs. Holden and Vining's ditto..Messrs. Ricketts and Co.'s Glass Works, Tuesday, Wednesday, and Thursday; Ditto Glass Bottle Works, every morning before 12 o'clock..Messrs. Gwyers' Rope, Twine, and Flax..Messrs. Edwards' ditto, ditto..Messrs. George and Co's Patent Shot..Messrs. Cook, Thatcher and Co.'s Patent Rope..Messrs. Alfred George and Co.'s Porter Brewery..Messrs. Lucas's Confectionary..Messrs. Washbrough and Hale's Clock and Brass Manufactory..Messrs. Edgar's Copper Manufactory..Messrs. Pountney and Goldney's Pottery..Messrs. Bevan's Machine Paper Factory. —ANCIENT BUILDINGS: The Printing Establishment of the Bristol Mirror. —SHIP BUILDING YARDS: Messrs. Hilhouse and Co.'s..Messrs. Patterson and Mercer. —TEA WAREHOUSE: Messrs. Acramans. —EXHIBITIONS, &c.: Mr. Johnson's Collection of Organic Remains..The Rev. Mr. Ellicombe's Collection of Hardy Plants..Mr. Brackenridge's Paintings at Brislington. —KITE CARRIAGES: Mr. Pocock exhibited his Kite Carriage daily upon Durdham Down. —The ZOOLOGICAL GARDENS open to Non-resident Members.

† Mr. Smith's Museum was an object of some attraction; amongst the contents most likely to excite the curiosity of the non-medical visitor, was the skeleton of a murderer, whose skull has been *phrenologically* marked by Spurzheim himself,—"the last words and dying speech," and all other documents relating to the murder, being actually bound up together in the skin of the malefactor, which had been tanned for that express purpose!—The heart of Sheriff Yeamans, who was hung in the reign of Charles I., 1643, by Fairfax, for an attempt to deliver the city to Prince Rupert, and which is converted into spermaceti.—A specimen of full grown *Siamesely*-conjoined twins. For the scientific pathologist, however, there were objects more worthy of attention; in the department of Necrosis, many interesting specimens of absorption and deposition of bony matter in accidents, and in Struma, and full 150 others of various kinds, hung in rows round the room. In the Museum upwards of one hundred cards, on each of which is displayed a set of biliary concretions, in some the specimens are very large and single,—in others 150 individuals are affixed; two specimens having a very singular external crystallization. The gem, however, of the Museum is the collection of Calculi. The plan of display is excellent. Each calculus, or, if there are several, one of the set is sawed through and fixed to the card-board, so that one half exhibits the nucleus and internal layers, the other half the exterior coating. Upon each card are written the name, age, domicile, &c. of the patient. Some of the calculi have foreign bodies for a nucleus,—a piece of bougie, a pin, four pieces of stick, the tooth of a cat, and a common cinder, two inches long and one broad.

These things we know are neither rich nor rare,
The wonder only is—how they got there!

Several specimens have eccentric nuclei. The most singular specimen is a set of four large, and twenty or thirty small calculi, entirely *carbonate o lime*. It is, perhaps, unique.

OUR WEEKLY GOSSIP ON LITERATURE AND ART.

OUR utmost limits will not enable us to complete our Report; we have resolved therefore to give a third double number, and thus clear off all arrears. Having now read the Reports, and calmly and dispassionately surveyed the entire proceedings, we are of opinion, that the results of the Bristol Meeting are most satisfactory: rather more than 1300 members were present, many of the papers read were very valuable, many important questions were discussed, and the Committee have been enabled to devote no less than 2,700*l.* in further aid of science and scientific research. These are beneficial effects, not to be questioned. It appears, however, that the Association does not work to the entire satisfaction of some influential members, who see or fear a growing evil, without a distinct idea how to guard against or remedy it; in fact, they are of opinion, that some proceedings in particular Sections had a taint of quackery, that there was no small leaven of twaddle in many of the discussions, and they are, in consequence, disposed to limit the sphere of inquiry, or restrict the numbers. Now, we concur generally as to the possible tendency of the Association; such an opportunity for personal display and cheap advertisement will not be lost by the far-seeing; but the remedy suggested would be in our opinion a still more mischievous error. There can be no such thing as an oligarchy of science, which these restrictions would tend to create. We take leave to suggest the most scrupulous care in the election of Chairmen to the several Sections, and a rigid determination on the part of such officers to stop at once all irrelevant, and assuredly all sinister talk, and a great deal more energy and resolution on the part of the Sectional Committee; the one (the Committee) should be the foreseeing and directing, and the other (the Chairman) the controlling mind of the Association. We take, as an illustration of the whole question, the proceedings on Thursday in the Section of Mechanical Science (to be published next Saturday). It appears from our Report, that while Mr. Enys was communicating much original information respecting the working of steam-engines in Cornwall (perhaps, says our correspondent, the most valuable communication made to the Section) he was interrupted by some person, who had for the occasion clothed himself in the garb of science, and who expressed a wish that he would conclude, as himself and friends were exceedingly anxious to hear Dr. Lardner on Steam Communication with America. Now, under the circumstances that a company has been established at Bristol for the purpose of opening such line of communication, the subject might have been judiciously selected for a popular address at any of the public meetings, and no one could have been chosen who would have treated it better, or more pleasantly, than Dr. Lardner; but such a discourse, delivered in the Sections, was an utter absurdity. The lecture was, and could be, little other than an excerpt from the last edition of his excellent work on the Steam Engine;† and it is really too ridiculous even for comment to suppose that scientific men had hurried from all parts of Europe, and even America, to hear a diluted version of a published paper. Let us not be misunderstood. We repeat, that the subject might have been with propriety selected for popular talk at the public meetings, and no one could discourse on it more pleasantly than Dr. Lardner; but when delivered in the Sections it was an utter waste of most valuable time.

MISCELLANEA

M. Ampère.—We deeply regret the death of one of the most gifted men in France, M. Ampère, member of the Institute and many other learned bodies, Professor at the Collège de France, &c. &c.: it took place at Marseilles, and his body was followed to the grave, both by the principal authorities of the government, and the scientific men of the neighbourhood. M. Matter, M. Darier, and M. Robert, each pronounced an eulogium over the grave, and the former, his friend and colleague, was deeply affected. No one who knew M. Ampère could fail to apply to him the feeling, that the sole glory of a man lies not in his knowledge, but in a life of honour, based upon morality. His works have had great influence on the progress of physical science in general, but more especially on the theory of electricity and magnetism. In all the concerns of private life, M. Ampère was admirable, and the tenderest and kindest feelings seemed always to guide his actions. His profoundest theories and greatest discoveries were generally the result of deep reasoning; and, with a head always engaged in the most intense speculations, it is not to be wondered at, that absence of manner, and an inattention to the commonplaces of life, were conspicuous in him; but he was wont to repair his mistakes with perfect good-humour, and were the young or uninitiated to be instructed, he would devote himself to them with the utmost cheerfulness and benevolence, would repeat the same thing again and again till they understood it; and it was a perfect enjoyment to him to witness their surprise and admiration at the success of an interesting experiment. He was another of those brilliant stars, which formed a galaxy round the thrones of Napoleon and Louis XVIII., and whom, we that are younger are doomed to see drop off, without the hope of, in our time, beholding such another. M. Ampère has left a son, gifted with high talents of a literary nature, and M. Savart, his fellow labourer, has been elected by the Collège de France, to their chair of natural philosophy.

Foundation of a New Prize.—The French Academy of Sciences have accepted the donation offered by the widow of the great Laplace, for the foundation of a new and perpetual prize, to the value of 215 fr., to be decreed every year to the first pupil who leaves the Polytechnic school. But if this school should cease to exist, the Academy will apply this prize to the encouragement of students in the mathematical sciences.

Mineral Springs at Récoaro.—A very important discovery has been reported concerning the mineral waters of a celebrated fountain, situated near Récoaro, a village of Lombardy. They are said to cure the malady of the stone, and, if the patient drinks the water for a certain time, he needs no other remedy, for the calculus will divide into small portions, and preclude the necessity of an operation. A Tyrolese, aged seventy, was cured last year by this means, and Dr. Breda, a skilful physician, has published a memoir of the case, which is said to leave no doubt upon the subject.

‡ Sixth edition. See from p. 307 to 336.

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